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CONTENTS.

An Asterisk (*) denotes an illustrated article.

OFFICIAL NOTICE—
Sixteenth Annual Meeting American Gas Light Association..... 217

EDITORIALS—
Briefly Told..... 218
An American Hand-Book for Gas Engineers—The Toronto Meeting—Retirement of the Messrs. Cosgrove—The Boston Situation—A Report from Inspector Spice.
*The Waterhouse System of Automatic Regulation..... 219
In the Purifying House, by N. H. Humphrys. C.E..... 220
The Average Meter System for Public Gas Lighting, by G. R. Strachan..... 222
*Latest Improvements in the Gas Balance, by Frederick Lux..... 224
The Comparative Danger of Alternate and Direct Electric Currents 225
Special English Correspondence..... 228
Gasholders Without Guide Framing—New Gas Analysis Apparatus—Relative Cost of Gas and Oil—The Local Government Act—Tar and Sulphate.
ITEMS OF INTEREST FROM VARIOUS LOCALITIES..... 229
Correcting a Rumor at Eastport, Me.—Gas Illumination at Buffalo, N. Y., During Fair Week—Annual Meeting, Jamaica Plain, Mass.—Contractor Bredel Puts on the Finishing Touches—Legal Proceedings Instituted at Los Angeles, Cal.—Public Lighting, Wilmington, Del.—The Naysmith Process to be Installed at Coshocton, Ohio—Selling the Keller Coke Crusher—An Important Legal Decision—Helping along the New Orleans (La.) "Square Fund"—Reconstruction of the Putnam (Conn) Works—Cheap Gas for Cooking Purposes at Galveston, Texas—Public Lighting, Omaha, Neb.—To Increase the Capital Stock—The Pacific Lighting Company—Public Lighting, Burlington, Vt.—Gas Company for Santa Monica, Cal.—Purchase of the Middleboro (Mass.) Gas Works—End of the Gas War at Maysville, Ky.—A Line or Two from Mr. Rollins—Further Hints from Putnam, Conn.—Shipments Made by the Ball Engine Company—Trying to Revive the Troy Fuel Gas Company's Charter—And Many other Items.
The Market for Gas Securities..... 232

[OFFICIAL NOTICE.]

Sixteenth Annual Meeting, American Gas Light Association.

OFFICE OF THE SECRETARY, Sept. 29, 1888.

To the Members of the Association:—Gentlemen: As the date of our next annual meeting has been stated so often that we must look for an excuse for restating here, force of habit it is which impels us to remark that the meeting will be held on Wednesday, Thursday and Friday, October 17, 18 and 19, in the city of Toronto, Canada, under the Presidency of Thomas Turner, Esq., of Charleston, S. C.

The members of the Association will be pleased to learn that Mr. Pearson, the General Chairman of the Committee of Arrangements, has returned from his trip, and is busy at Toronto arranging the details of the Convention.

The headquarters of the Association during the sojourn at Toronto will be at the Rossin House, but as that hotel could not spare accommodations for all the members, it will be necessary for a portion of the delegates to stop at the Queen's hotel; both hotels are in every way first class, so we may expect to be comfortably housed during the convention. Parties desiring to secure rooms should write to the hotels prior to Oct. 10. I trust members will bear this in mind, and so save themselves from possible disappointment. The rates at either house are from $2.50 to $3 per day, including board. Both hotels are within five minutes' walk of the Union railway station. The meeting of the Association will be held at Temperance Hall, on Temperance street; a hall which I understand is well suited for our purpose, and where we will be free from some of the annoyances which have surrounded us at some of our previous places for meetings. The convention will be called to order at 10 A.M. on Oct. 17. A banquet will be tendered the members on the evening of Thursday, the 18th proximo, and on the last day of the convention the members and their ladies will be invited to take a drive around the principal parts of the city and suburbs. Toronto is a very ornate city, with pretty outlying districts; we may, therefore, expect a very pleasant drive on the 19th.

I have obtained from the Trunk Line Association and the Central Traffic Association special railroad rates for the members and their friends attending the Toronto meeting. The reduction is made on the certificate plan; that is, parties paying full fare out and obtaining the proper certificate, will obtain the return ticket at one-third the regular fare. The full details will be given in a circular which will be issued within a few days, and which will, I trust, receive the prompt and careful attention of the members. In this connection I wish to remind the members that Toronto is not as difficult of access as many of us have thought it to be. In fact, a study of the map will convince one that whatever can be said of the other parts of Canada, certainly Toronto has not been left out in the cold; on the contrary, it is very centrally located, and is easy of access from all of our large cities. It is safe to say that Toronto can be reached from the following cities, as well as most points in the Eastern and Middle States, in about 24 hours: Chicago, Pittsburgh, Baltimore, Portland, Cincinnati, Philadelphia, New York, New Haven, Harrisburgh, Boston, Hartford, and Detroit. Passengers leaving New York in the evening are due at Toronto the next forenoon.

I wish the members who have not already replied to my circular of Sept. 16 would please give the matter their immediate attention, as it will be absolutely necessary for members to apply to me and secure the necessary certificates if they wish to take advantage of the reduced railroad rates. I am also anxious to know, at as early a day as possible, whether a sufficient number of members will join the New York and Boston parties to warrant me in chartering special cars.

The following papers are promised; their titles together with the names of the authors constitute a most worthy nucleus for the literary programme of the convention:

"Experience in Distributing Gas Under Extremely Low Temperatures," by D. H. Geggie. "Observations During Many Years' Experience in the Gas Business," by James R. Smedberg. "Construction of Gasholders with Wrought Iron or Steel Tanks above Ground," by Frederick Mayer. "The Steam Stoker and Improved Charger," by A. Q. Ross. "Daily Experiences and Observations of a Gas Manager," by James Somerville. "Gas Coals, with Especial Reference to Provincial Coal," by Jas. D. Perkins; "Enriching Gas with Naphthaline," by Arthur Kitson. We have now seven good papers, but could take care of a couple more.

The "Gas Balance," invented by Frederick Lux, of London, will be exhibited and described during the meeting.

I would repeat what I have said in former years in regard to the Question-Box—namely, if this adjunct to our meetings is to be used to advantage members should send in to the Secretary their questions at an early date, in order that mention may be made of them in a subsequent circular, thus giving the members an opportunity to come to the meeting prepared to answer the conundrums.

I have the following question, and will ask some of the members to answer it during the meeting: "What is the extra cost on wear and tear of meters where iron purification is used?"

It may be well to remind the members—as I did more particularly under date of April 25th—of the prize which will be offered at the coming meeting for the best paper on "Naphthaline." The amount of the prize is $25.

In conclusion, let me remind the members that the coming meeting will be the first one held by the Association in Canada. All who attend the convention will be sure of having a profitable and enjoyable time, and I trust the members will commence at once to so make their plans as to insure their attendance at Toronto next October.

Respectfully,

LAWRENCE, MASS. C. J. R. HUMPHREYS, Secy.

BRIEFLY TOLD.

AN AMERICAN HAND-BOOK FOR GAS ENGINEERS.—An often repeated criticism launched against the American gas engineer was that he appeared to be either unwilling or unable to contribute anything of importance to the standard literature of the gas maker's craft in general, and we are disposed to admit that the first cause for the criticism might have some foundation in truth; but as to the second (that of inability) we must interpose an emphatic denial. Unwillingness may spring from many conditions, and the American engineer's seeming unwillingness to assume the role of authorship is easily accounted for on the score of his relations to his employers. They demand all of his time—not excluding many hours of the night—thus "protecting" him from the dangers of idleness; and an author cannot blossom out in full flower in the short period usually allotted the gas engineer for his vacation. Apart, however, from all such imaginings or speculations the pleasant fact confronts us that to the name of Humphreys (whose excellent brochure on the "Management of Small Gas Works" really marked the first step taken by American gas engineers in the field of the home literature of their profession) we can now add that of Mr. Wm. Mooney, whose "American Gas Engineers and Superintendents' Hand-Book" is before us.

The author needs no introduction to the fraternity from us, for his other "works" have spoken frequently and well for his ability and cleverness as a practical constructor. And to this it gives us pleasure to add that his Hand-Book is compiled on the lines which have stood him so well in other directions. The author having dedicated the volume (and a graceful act it was) to the Society of Gas Lighting, he then introduces himself to his readers in the medium of a very modest preface, the first paragraph of which induces us to say that the friend who suggested that "such a book would fill a void of long standing," made a wise remark, even though the like had often been heard in relation to about any and all subjects.

The book in general appearance, as to typography and arrangement of matter, strongly suggests Mr. Newbigging's well-known and excellent volume, but with this important difference that the American production is printed on much thicker and stronger paper. And so, even if it is rendered thereby a trifle bulkier, it is better calculated to withstand the frequent thumbings to which its pages will be subjected. It is nevertheless a volume that can easily be carried in one's pocket.

The attempt to give a synopsis of its contents will hardly be expected here; nor neither is this necessary, because our advertising pages afford a good idea of the value of the matter within its covers. To sum it all up in a few words, the Hand-Book is neither more nor less than a complete guide to the gas engineer, who, when in doubt about some apparently trivial figure, etc., can by a reference to its pages either prove or correct his memory on the doubted point. Apart from the strictly technical nature of the book many hints outlining the author's views on matters corelated to the gas industry are advanced; and his chapter on water gas, abbreviated though it be, and all because of the great difficulty experienced in collating details that might be put forward without danger of precipitating a war of words among the owners of processes, will be welcomed.

In conclusion, we can but say that Mr. Mooney's successful attempt at compiling a Hand-Book for American gas engineers ought to merit their grateful and practical appreciation. The price at which he has placed it before them ought to guarantee a speedy exhaustion of the first edition, and those who purchase it will certainly have obtained their money's worth.

THE TORONTO MEETING.—Not much remains to be said in connection with the preliminaries for the Toronto gathering of the American Association, for all the initial moves have been made with care and thoughtfulness, nevertheless, and it almost goes without saying, all the efforts of the officers, and all the plannings of the Association's Canada hosts for the proper entertainment of their guests will seemingly be poorly appreciated unless the members turn out in force for the promised invasion. This is a case where the larger the number of the invaders the greater will be the pleasure of the invaded. The question of membership attendance recalls to mind the rather rueful knowledge that Honorary Member Spice—or the Hermit of Westminster—will not be on hand. Because of pressing business he had to arrange his visit to America this year for a return to England sooner than his usual custom. We would direct especial attention to Secretary Humphrey's repeated and emphasized call for a reply to his circular of September 16th, in which he made known the conditions necessary to be fulfilled by those desirous of taking advantage of the concessions obtained from the railroad companies in respect of reduced transportation rates. Again, a similar warning is sounded in the instance of those who will start for Toronto from either Boston or New York. Certainly, a sufficient number will leave from both places to warrant the chartering of special cars for their conveyance, and this means greater comfort and added freedom. If comfort consideration is to have its due weight, then the Secretary ought to be advised forthwith by those who are desirous of securing it.

RETIREMENT OF THE MESSRS. COSGROVE.—The following letter explains itself:

"OFFICE NORTHWESTERN GAS LIGHT AND COKE CO.,
EVANSTON, ILLS., September 25, 1888.

"To the Editor AMERICAN GAS LIGHT JOURNAL:—It is with no little regret that, on account of ill health, I have been compelled to quit the gas business. My son and I have sold the controlling interest in the Northwestern Gas Light and Coke Company, at Evanston, Ills., to Edwin Lee Brown, Esq., of Chicago, who has been the other principal stockholder for many years. The business will be conducted as heretofore—with good prospects ahead—combining both coal and water gas. In advising you of the above change, I cannot refrain from adding an affectionate good-bye to my many good friends of the gas fraternity, and especially of the Western Gas Association—of which I have been a member since its organization, having attended every meeting prior to the last—and hereby take this method of extending to them my warmest thanks for the uniform courtesies and big-hearted treatment I have received at their hands these many years, both in business and social ways. Wishing them all Heaven's richest blessings, I am, very sincerely,

"THOMAS A. COSGROVE."

And we sincerely regret that Mr. Cosgrove has to abandon his active and honest connection with the gas business; and we regret it all the more on account of the reasons which impelled him to the step. Stepping down and out is bad enough, but when the move is made through illness the worst possible reason is advanced. However, rest works wonders, and we hope sincerely that Brother Cosgrove shall yet find it possible to listen for many years to the hearty congratulations with which his presence at the gatherings of the Western Association will be greeted. He also has the satisfaction of knowing that the Evanston works, which he so zealously looked after in the past, have been handed over to a man of his own stamp.

THE BOSTON SITUATION.—It has been current rumor in Boston for several weeks back that the backers of the Bay State Gas Company had succeeded in enlisting English capital to take up the pooled stock of the Boston Company; but while an appeal of a nature sufficiently strong to induce the aforesaid capitalists to send out a special representative to look over the ground has been successfully made, it is, we think, true that the matter is a long way from settlement yet. It is not likely that foreign capital would rest content with anything short of the complete absorption of all the suburban Boston Companies, in addition to the old Company and those now in control of the Bay State syndicate; and as such absorption would require an expenditure certainly in excess of ten millions of dollars, and as some of the subsidiary holders in the smaller Companies are not yet educated to the point of understanding why their properties are not as valuable (if not more so) to themselves as to anybody else, we incline to the view that the end is not yet.

THE Inspector of Street Lights (Prof. Robert Spice) for Brooklyn, N. Y., has handed in a report to his superiors in which he asserts that the old-time iron burner is in use in a majority of Brooklyn's street lamps, and then naively adds that iron burners were discarded for the steatite type in England some 25 years ago. To our knowledge steatite burners were used in Brooklyn for street lighting as far back as 1871—and extensively used, too. In fact we thought their use in Brooklyn was universal, at least at the present time. Another interesting fact brought out in the Inspector's report is that the rate of consumption in the street lamps is fixed at 3 cubic feet per hour. Here is an opportunity for the Inspector to perform a good service for the citizens, which he will have succeeded in accomplishing when the rate is increased to one that would not disgrace the town of Skaneateles, for instance.

MR. JNO. S. LEVIS, formerly in charge of the New York branch of the business of the Combination Gas Machine Company, of Detroit, Mich., is now with the Gilbert & Barker Manufacturing Co., this city.

The Waterhouse System of Automatic Regulation.

An ingeniously constructed automatic regulator is now furnished with the Waterhouse system of electric lighting—a system that made its first appearance on the market some two years ago, and which has advanced so rapidly that it is now ranked among the best systems in use. No technical description (owing to pending applications for patents) of the Waterhouse Automatic Regulator has been published; but now that broad patents have been allowed for the protection of the invention, we place before our readers the accompanying cuts and an explanation of the mechanism.

A clear idea of the utility of the apparatus may be gained by an inspection of Fig. 1 (Form 1), showing a diagram of the Waterhouse type of dynamo, with a closed circuit armature *A*. The commutator *C* shows three brushes—*a* and *b* being the main circuit brushes, and *c* the auxiliary brush. From the positive brush *a* the current passes to the conductor, around the field magnets *F*, to the resistance *R*. The current from the auxiliary brush *c* passes directly to the resistance *R*, leaving the field magnets out of circuit. The current from both circuits (both field and local) joins at *R* and passes to the lamps, the current on the lamp line being the sum of the two. The amount of current in the field and local circuits is in proportion to the resistance *R* in each. The brushes have a fixed position. There is in every dynamo a point of maximum commutation on the armature which changes with the resistance on the lamp line, moving with the rotation (toward brush *c*) when the resistance decreases and back when it increases. This affects the current in the local and field circuits as follows: When the lights are turned out the line resistance is decreased and the maximum point moves forward, forcing additional current out of brush *c*, and lessening the quantity passing out from brush *a*. This reduces the current in the field magnets and the E.M.F. in the circuit, and consequently lowers the power required to operate the dynamo; but the current on the lamp line remains constant, because the local circuit is increased proportional to the decrease of the field circuit, and therefore the remaining lamps retain their full brilliancy, while the current cannot increase and destroy the apparatus. Thus it will be seen that the very tendency of the machine is to perfect regulation without the aid of a mechanism; but when to this is added the simple regulator, which makes the regulation instantaneous by assisting the current to pass out at brush *c*, and opposing its passage around the field magnets by way of brush *a* when lights are cut out, and forcing it out at brush *a* around the field magnets, by opposing its passage out at brush *c* when the lights are cut in, the efficiency of the method can be appreciated.

The regulator is illustrated by the slide in the form, which is controlled by a solenoid. Any tendency of the current to increase raises the contact (see slide, Form 1), the result being a decrease of the resistance in the local circuit and an increase of the resistance in the field circuit. More current, therefore, will flow through the local circuit and less through the field circuit. The generating capacity of the dynamo is instantly reduced, and any tendency to produce a current above the standard is overcome. Should the tendency of the current be to decrease—say by a reduction of the speed of the armature—the slide lowers, increasing the resistance in the local circuit and reducing it in the field circuit. More current will then flow around the field magnets and less out on the local circuit—the generating capacity of the dynamo will, therefore, increase to maintain the current at standard.

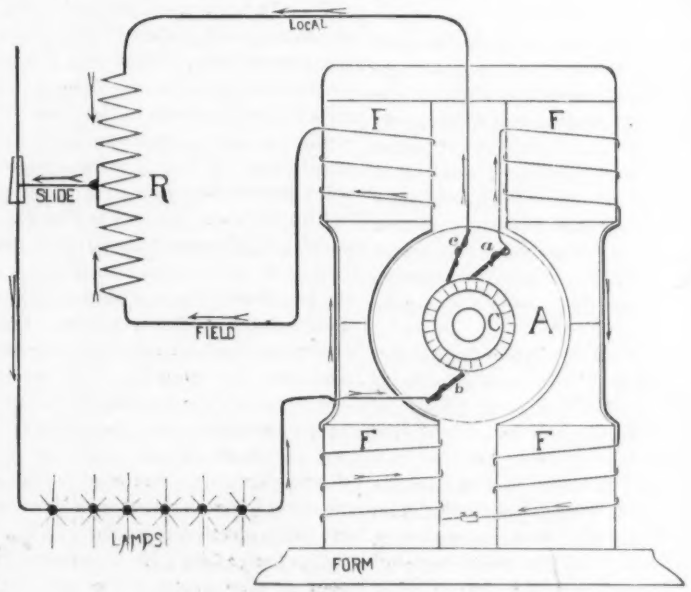

Fig. 1.

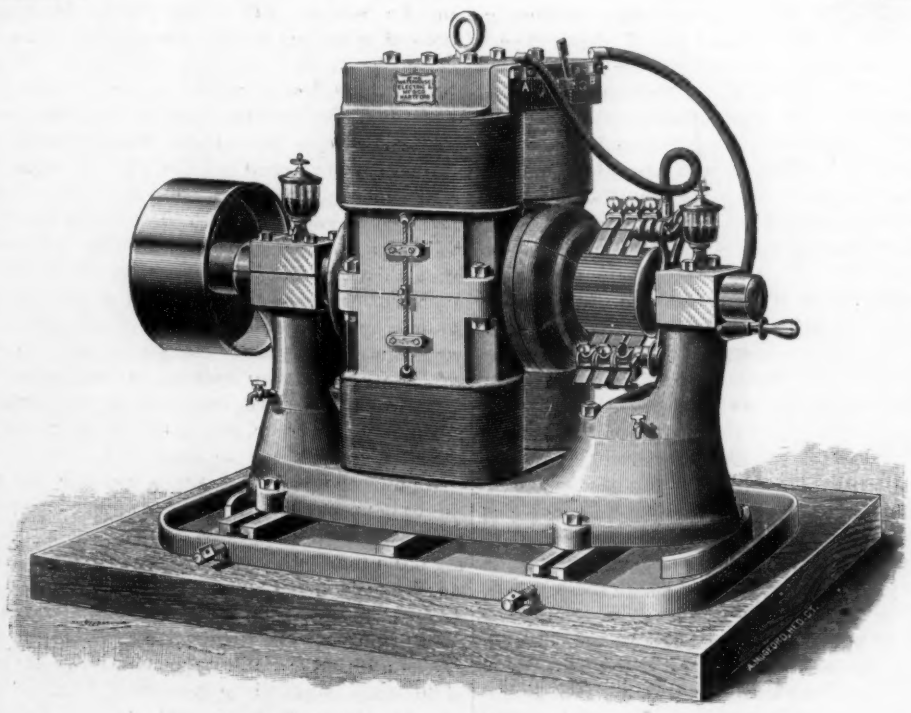

Fig. 2.

It should be stated that the use of resistance for balancing the field and local circuit is a small amount compared to that used by the lamps, and is not interposed (as can be seen) for the purpose of compensating for lamps turned off.

The Waterhouse regulator varies the E.M.F. directly with the resistance on the lamp line, producing self-regulation and maintaining on the lamp line the standard current, whether one lamp or the full number are burning. By this method, as the lamps are cut out the current is reduced in the dynamo, even to the fraction of an ampere; and so it is apparent that one light on the Waterhouse dynamo can be maintained for any length of time without producing more than the standard current. When it is remembered that many electricians of great prominence have struggled with the question of producing an automatic regulator for closed circuit armatures, with no ultimate success having attended their efforts, the importance and value of the Waterhouse solution of the problem can be appreciated.

The regulator is applied to the Waterhouse dynamo (shown in Fig. 2), which has a closed circuit armature. This type of armature is the most efficient possible to produce, and contains a core composed of large disks insulated from each other to destroy the possibility of eddy or heating currents; and it is also found in practice that the Waterhouse system is a most economical one to operate. The Waterhouse arc lamp forms a new family of lamps, differing from all others; and it is reasuring and remarkable (in view of recent trials for infringements) that at this seemingly late day in the evolution of applied electricity there could be evolved a system free from patent suit vexations. It thus stands for an advance in the art.

Proprietors of gas companies who think of engaging in the supply of electric light have many advantages now over those who originally purchased plants of one type or another, the greatest of which perhaps lies in the fact that they can take their choice out of systems that are far superior to some of those with which their competitors are burdened. In this connection gas men can lose nothing but may gain much by thoroughly investigating the Waterhouse type of installation.

In the Purifying House.

By Norton H. Humphrys, C.E.

Our English correspondent, Mr. N. H. Humphrys, is at present engaged in communicating to a contemporary (the *Gas Engineer's Magazine*) a series of articles on the arrangement and management of that important department of a gas works—the purifying house. We herewith reproduce the first two of the series:

Article No. I.

When on a previous occasion some remarks were offered by the present writer on the subject of retort house operations, the place where gas is first produced was put forward as the most important about a gas works. Sometimes this is overdone, and other departments are scarcely looked after at all. The superintendent almost lives in the retort house. Without detracting in any way from the important position ascribed to that part of the gas works, it is proposed in the present paper to show that considerable economy may be obtained by systematic supervision over the operations conducted in the purifying department; by which term, of course, we mean the dry purifiers, to the exclusion of washers, scrubbers, condensers, etc. Perhaps something may be said about them on a future occasion.

On going into any department of a factory or workshop for the first time, the natural inquiry is, "What is done here?" It may at once be premised that the work done in the purifying house is the filling and emptying of purifiers. Either in the same building, or in an adjacent shed, the work of preparing the materials for use is carried on. It is equally obvious that the object sought is to do as little work as possible, or, in other words, to induce the boxes to run as long as possible without changing. The cost of each change, involving as it does the emptying, refilling, and removal of the old and preparation of the fresh material, is an important item. In many cases it is something more than a question of money, and that of nuisance comes in. Granted that all tar and ammonia has been completely removed from the gas before it reaches the dry material—and no excuse can be urged in the light of modern experience if this is not done—still the purifier must be full of gas when it is opened, and a certain half gassy, half metallic odor hangs about the foul material. A brisk wind will disperse it, but if a box is opened in still weather this characteristic odor will hang about over an area of a quarter of a mile square or so for some time. Spacious and lofty buildings with ventilators in the roof will, of course, mitigate this inconvenience; but if the gas works are situated in a closely inhabited neighborhood, an occasional whiff of it is unavoidable. Still, it is quite possible to conduct operations without causing much complaint from neighbors.

A great many different opinions exist as to the best way of laying out the purifiers, the arrangement of the valves, etc. Some simply place the boxes upon a series of piers of bricks or concrete in the open air; others add a roof to keep off the rain; and others, again, inclose them in a building. Climatic influences, of course, are the chief considerations here; but care must be taken that the gas, in the course of its passage through the purifiers, is not subjected to considerable variations of temperature. At the inlet to the purifier house the gas will be about 60° in temperature in a small or medium size works, and 5° or 10° above that limit in a large works. If by reason of exposure of the purifiers to the influence of frost, or cold winds, the gas is lowered in temperature to the extent of 20° or 30° in the course of its passage through these vessels, several difficulties arise. In the first place, large quantities of moisture will be deposited, which will be apt to clog the material and cause an undesirable amount of back pressure. The water also becomes thick and muddy by reason of holding fine particles of purifying material in suspension, and the system of pipes by which it is drawn off is apt to become choked.

In any case a certain amount of water will condense in the purifiers, and this should be drawn off as directly as possible, on account of its liability to carry mud with it. If allowed to find its way to a general collecting box, either on the inlet or the outlet, there will be some risk of stoppage; and therefore it is a great convenience if there is a separate overflow on the inlet of each purifier. If this appliance is situated on the inside of the valve, then any failure on its part influences one particular purifier only, which can be thrown out of action and the defect remedied without interfering with the make of gas. The overflows should all be self-acting, conveying the contents to a liquor well. If they have to be emptied by pumping, there is not only extra labor, but the risk of their being forgotten.

In addition to the increased deposition of water, any extreme reduction of temperature will be apt to favor the formation of naphthaline crystals. There is also a reason to fear a loss of illuminating value. The combined influences of cold and friction, to which the gas is exposed in the act of passing through layers of lime or oxide at a low temperature, tend to cause condensation of those heavy hydrocarbons which mainly constitute the illuminating value of coal gas. And besides this, many are of opinion that the activity of the purifying material is less at a low temperature.

The question of housing in the purifiers assumes increasing importance as the size of the works increases. The erection of a building over a set of four 10 feet square purifiers is an inexpensive matter, but a building to contain a set of four 30 feet boxes is a costly affair. Perhaps this is the reason why, although it is a general rule in small and medium size works to close in the purifiers, in large works there is a decided preference to leaving them in the open. There is also another reason which renders it more possible to leave large purifiers in the open rather than small ones. Not only is the proportion of outside surface to cubical content considerably less in a large purifying vessel than in a small one, but in the large gas works the gas is higher in temperature in the first place, and it passes through the purifiers more rapidly, and therefore does not run so much risk of being chilled. In works making perhaps 100 to 150 millions per annum, it is now no unusual thing to put in purifiers as large as 30 feet square. Practical engineering conditions do not allow this limit being greatly exceeded, even where the make is four or five times that quantity. In some cases the engineers of large works seek to secure the benefits attendant upon the use of purifiers of ample size as proportioned to the make of gas, by having, say, three distinct sets of purifiers, and dividing the gas into three separate streams. Where this plan is followed out to such an extent as to place the purifying conditions on a par with those obtaining in smaller works, the necessity for protection from the weather becomes equally important.

Another reason why it is more feasible to have the purifiers in the open in large works, is the fact that they are not only several acres in extent in themselves, but as a rule are situated outside the town. So there is plenty of room for diffusion of the odor which follows the opening of a purifier. But in small towns the whole of the works may be inclosed in an acre or two of land, and there may be dwelling houses within 20 yards or so of the purifiers. Under such circumstances as these it is needless to say that a closed building over the purifiers is a necessity. The building not only facilitates keeping the purifiers warm, but also prevents the material being scattered by wind, and enables the purifiers to be emptied or filled without regard to the weather.

In deciding upon the size and number of purifiers required, it is first necessary to know the work that is to be done by them. If there is any obligation to keep down the sulphur compounds below a prescribed limit, there are three distinct sets of operations to be carried on—the removal of carbonic acid, removal or partial removal of sulphur compounds, and the elimination of sulphuretted hydrogen. Where these vexatious and oppressive clauses are not enforced, the removal of carbonic acid becomes an optional matter, depending upon considerations to be presently noticed, and there is only sulphuretted hydrogen to be taken out. Carbonic acid must be completely removed before the sulphur compounds can be dealt with; and this is the reason why the "sulphur clauses" so largely increase the cost of purification. It rarely happens that it "pays" to completely remove carbonic acid, and, except for the purpose just named, the extraction of this substance is not often thoroughly carried out. A general plan is to have one or two small purifiers for lime, in addition to the set for oxide.

Chemists and scientists have philosophized largely upon various questions connected with purification, such as the proper speed at which the gas should pass through the material, the size of purifiers in proportion to the make of gas, the proportion of "active" and "passive" oxide contained in the oxide of iron used, etc.; but I do not know that they have been of much assistance to the practical man. At any rate, the operations of the purifier house are carried on upon the lines suggested by practical experience rather than upon the scientific methods which are now known to be so much more preferable in every way. I see in the columns of the *Gas Engineer's Magazine* so much about the need for scientific education in gas works that sometimes I feel inclined to wish that a full-blown college professor could be brought into the purifier house, provided with the necessary gang of laborers and a supply of oxide of lime, and then made to set to work and show how much better or cheaper he could conduct the purification—say for a twelvemonth—than the much abused practical man. It is to be regretted that no definite lines have yet been laid down as to the number of boxes, and the size in proportion to the make of gas, that are suited to secure the best results. As it is, in existing gas works we have the plant laid down, and are called upon to do the best we can with it.

Of course, in any case, the gas must be kept perfectly free from sulphuretted hydrogen, and in order to carry this on with certainty there should be a set of at least four boxes for oxide, which may be worked in rotation by one center valve, or preferably by at least two separate valves, or, better still, by a series of six four-way valves. A single valve is complicated in structure and awkward to deal with if it gets out of repair, and there is also some risk of a trace of foul gas finding its way through by a short cut direct from the inlet to the outlet. If a defect of this sort develops itself in the heavy season, and cannot be remedied without stopping the make of gas and taking the whole concern to pieces, the results are very unsatisfactory. The old saying about having two strings to one's bow applies very forcibly in the purifier house, and anyone who has once been troubled with a faulty center valve will be anxious ever afterward to have at least two separate and distinct valves between the inlet and the outlet. It is also very inconvenient to be tied down winter and summer alike to the jog-trot, three on and one off arrangement, to say nothing of the waste of purifying capacity involved in having one box always idle. On the whole, I prefer the arrangement of six four-way valves, as enabling any valve except No. 1 and No. 6 to be cleaned or repaired without stopping the make of gas; as allowing any number of purifiers from one to the full complement to be in work as desired; as enabling one box to stand off for an indefinite time, if such is necessary; and admitting considerable latitude in the order of sequence. This arrangement has the effect of dividing the boxes into two groups of two each; both can be worked together, or either one can be shut off, and either one or both members in each group can be worked. No. 1. valve is the main inlet, and its four branches comprise the inlet, connection to No. 2, connection to No. 5, and connection to No. 6, which is the main outlet. The four branches of No. 2 represent respectively the connection from No. 1, inlet to A purifier, connection to No. 3, and inlet to B purifier. No. 3 has the connection from No. 2, outlet from A, connection to No. 6, and outlet from B. No. 4 and No. 5 are connected in a similar manner to C and D, and No. 6 has connections from 1, 2, and 5 respectively, and the main outlet. The four-way valves are simple in construction, cheap, and readily repaired.

Article No. II.

The question which of the two plans of setting purifiers is preferable—whether at ground level, or "on the first floor," that is, supported on girders at a sufficient height to leave a clear headway beneath—is one of constructive detail, respecting which opinions are pretty equally divided. The first named is cheaper, as avoiding the cost of columns and girders, of the upstairs floor and staircase, and of running up the walls to a height of at least 20 feet. Assuming that the purifiers are 5 feet deep, there must be at least 8 feet clearance below, and 7 feet above. But if they are set at ground level the walls of the building need not be carried up higher than about 12 feet. The advantages secured by the upstairs plan are that all the surface of the boxes—bottom, sides and top—is fully exposed to view, also all parts of the connections and valves. So that any leakage or other defect is at once detected, and can be readily got at and remedied.

The floor below can also be used as a revivifying floor, though the pillars and other supports rather interfere with its use for this purpose, and the fumes from the fouled material are not particularly beneficial in their effects on the ironwork. The upstairs arrangement also affords some facility in discharging the vessels, by means of doors on the bottom, or a central tube or column carried up inside the purifier and covered with a round cap; but against this must be placed the fact that the fresh material must be lifted up, for which purpose a hoist or other mechanical device is necessary. The advisability of placing the purifiers overhead is a matter that must be determined by local circumstances, such as cost of ironwork, room at disposal, etc.

If the vessels are placed on ground level they should be so supported on brick piers or girders as to allow inspection of the bottoms; and the valves and connecting pipes should be laid in brick channels having removable coverings, so as to enable the whole to be thrown open from one end to the other, if desired. These channels should be large enough to admit of repairs, and it is important that they should be well ventilated throughout.

A very usual practice is to provide a test-cock, or perhaps two, on the lid of each purifier, in addition to the usual air plugs. But it is more convenient, especially in the case of overhead boxes, to place them upon the outlet pipes of each purifier. I have seen test-pipes brought together into one wooden case, and this plan appears very handy and tidy, but I do not like it, because it is not possible to get a fair sample of the gas through a length of perhaps 30 feet of wrought iron pipe. To start with, the whole length of pipe must be cleared out before a fair specimen of the gas arrives at the test-cock, and even after that the presence of condensed moisture, iron rust, etc., in the pipe will be liable to retain portions of the impurities. The sample of gas, in effect, undergoes a sort of rough purification before it is tested. It is, therefore, desirable that the test-cocks should be situated directly on the outlet pipe itself, though a length of 2 feet or so of service pipe is not objectionable.

There is a handy little arrangement in the market which is better than ordinary cocks for testing, and is, I believe, known as Drory's test-cock, of which Messrs. S. Owens & Company are licensees. It consists of a small cylinder projecting into the main, and is so constructed as to admit of a piece of test paper being introduced, exposed to the full current of gas flowing through the pipe, and withdrawn, without any escape of gas. I like this little appliance, because there is something offensive about the practice of allowing gas to escape, even in small quantities, under any circumstances whatever.

Since the rage for large purifying vessels set in there has been a tendency to diminish the number, and many try to work with as small a number as two boxes. Granting that the vessels should be as large as possible, I still object to reduce their numbers, considering that a less number than four cannot be worked to the best advantage. Either there will be a risk of supplying foul gas, or the material must be rejected before it is thoroughly fouled. Suppose we are working with only two boxes. In the first place they are both supplied with clean oxide. After a time the first one yields a foul test with lead paper. A cautious manager would say, "turn it off at once and recharge it." Whilst one intent on the £ s. d. side of the question would be inclined to chance the second one for a time. It is always best, indeed we could almost say indispensable to safe working, to have the last box clean, because however carefully filled in, a purifier cannot be relied upon to go a set time. Perhaps there is a thin place or two where the oxide does not lie so close as in others, or the quantity of sulphuretted hydrogen is subject to variations. The reasons are not very definite, but everyone knows that oxide boxes have an unpleasant knack of "going off" just when they are expected to keep on.

According to theory, when the foul gas is admitted into a clean purifier the lower parts are acted upon first and turned black, and the black line should advance steadily and regularly up through the whole horizontal section of the material until it reaches the top, at which time the gas at the outlet should show a foul test. It might also be assumed that when these conditions obtained the oxide was fairly well saturated with sulphuretted hydrogen. But do these conditions obtain in practice? If we lift the cover off a box that has just commenced to show a foul test, the usual experience will be that a large portion of the oxide in the top layer retains its original color. A black patch or two will be found, indicating where the foul gas has got through. But even after the material is thoroughly blackened throughout, there is good reason to suppose that it is capable of doing more work. When incapable of extracting the whole of the sulphuretted hydrogen it may be able to take more than 50 per cent. of it. I have found that oxide when used in a set of four purifiers of ample size became charged with a saleable degree of sulphur—about 50 per cent.—quite as fast as when used in smaller purifiers, although subject to perhaps twice as many exposures and revivifications in the latter case.

I am inclined to account for the well-known experience that the purifiers go so much longer and pass more gas in summer than in winter by the fact that the gas gets a proportionately larger amount of scrubbing and washing—and in most cases the same scrubbing and washing capacity remains in use that is called upon in mid-winter to deal with perhaps three times the quantity of gas—and partly by the probability that the oxide in the purifiers is saturated to a greater degree, the slower current of gas leaving more time for the oxide to come in contact with it. Or we might say that in summer the sulphuretted hydrogen is removed at an earlier period in the course of its passage through the purifiers than in winter.

The method of working four purifiers requires but little explanation. In the first place, they are all charged and put into operation. Let us distinguish them as A, B, C, D, starting in the order that the gas is admitted. The person in charge tests the gas daily at the outlet of C. Of course, A would be fouled first, B next, then C. As soon as C shows a foul test A is shut off, B, C and D meanwhile remaining in operation. It is then emptied and refilled, and the gas from the outlet of D is introduced into it, the order of procedure being B, C, D, A, and the test is now applied at the outlet of D. Each purifier, after showing a foul test, continues in operation until two beyond it have been also fouled, and thus sufficient time is allowed to enable the limit of saturation of the material, so far as regards sulphuretted hydrogen, to be nearly approached, if not actually attained. I have seen large purifiers in which

test-cocks were introduced at intervals representing the space between each tray in the sides. Such an arrangement may be useful at times for judging the state of affairs in the purifier, but I should never care to have only a single tray of oxide between foul gas and the main outlet.

As to the thickness or depth of the layers of oxide in the purifier, it may be taken as a general rule that the thicker the layer the better, because more material is thus got into the vessel than would be the case if a large number of thinner layers were used, and it may therefore be expected to go for a longer period without changing. In a purifier having four floors of grids, each 10 inches apart, the material put in four layers would average about 7 inches on each layer, or 2 feet 4 inches in all. But if after putting in the bottom row of grids the purifier was filled to the top edge, the other grids being left out, we should get a total thickness of 3 feet 4 inches, or, say, 30 per cent more material in the box. But the thickness of the material is limited by the practical condition of back pressure, concerning which the experiences in different works vary greatly. In some cases the gas is caused to pass through perhaps eight or ten boxes, each filled as full of material as possible. In others a layer of not much more than 12 inches thick will cause so much back pressure as to be unworkable.

The principal causes of excessive back pressure are incomplete condensation and insufficient purifying area. The first-named leads to a clogging of the material with tarry matters, and the second to considerable velocity of the gas in passing through the vessels. The greater the speed at which the gas travels, the greater will be the hindrance and check offered by the material. The purifiers do not give so much pressure in summer, when the make of gas is less, as they do in winter at the time of maximum consumption, and one of the advantages secured by putting down larger purifying plant is that thicker layers of material can be used.

As instancing the effect of purifier area on the back pressure, an experiment tried by the writer may be mentioned. A purifier (20 ft. square) was charged with 3 feet total thickness of oxide, and a smaller vessel in the same house, belonging to an old set about to be discarded, which was only 12 feet square, was charged with a similar thickness of the same kind of oxide. The pressure was read at the inlet and outlet of each box for several days in succession, and it was found that the large box only gave a back pressure of 4-tenths, but the smaller one gave 11-tenths.

A great deal depends upon whether the gas has been thoroughly and completely condensed. As already observed, a certain quantity of moisture will be deposited, because the purifiers are colder than the preceding apparatus. The condensers, scrubbers and washers are usually in sheltered positions in the vicinity of the retort house, but the purifiers are away in the open. Sometimes it will be found that the back pressure is greatly increased by reason of the material on the bottom row of grids becoming soaked with water. As a cure for this a shallow layer of breeze, spent tan bark, or other suitable absorbing material may be spread on the bottom row of grids. But there should be no considerable quantity of tar in the bottom of the purifiers. If such accumulates there trouble from back pressure may be expected.

The proper place for the removal of tar is the condenser, and the dry purifier is in no way suited for completing the work of condensation. If the gas is not completely freed from suspended matters before the purifier is reached the tar, etc., will accumulate at the lower part of the bottom layer of material, perhaps clogging it to such an extent as to render it necessary to throw the purifier out of use before it is thoroughly fouled.

As will be plain from the foregoing considerations, the back pressure given by the purifiers at large works is greater than that prevailing at small works, because the proportion between the make of gas and the area of the vessels is less. It must be remembered that the area of passage for the gas through the material is not the same thing as the area of the vessel; such would be the case if the box was empty, but the material itself occupies some space, and the true area of passage for the gas is the difference between the aggregate bulk of the material—such as would be obtained if it could be compressed together in a perfectly solid lump—and the space occupied by it in the purifier. The finer the condition of the material, and the smaller each fragment composing it, the less will be the area left for the gas to pass.

Certain kinds of oxide are found to "lay very close" in the purifier; and are therefore unsuitable for use, although they are of high quality from a chemical point of view. The maximum thickness of layer that can be comfortably worked in practice is a factor that can only be decided by careful observation and experiment in each particular case. The behavior of a fresh consignment of oxide in respect to back pressure, especially if of a different kind to that formerly in use, is a matter of importance. Oxide may be rendered lighter and less liable to excessive back pressure by admixture with sawdust, but material so treated is sometimes objected to by the purchasers of spent oxide.

The Average Meter System for Public Gas Lighting.

By George R. Strachan, C.E.

The writer has been experimenting with regular gas burners some 18 months, with a view to ascertain their reliability under various and varying pressures and conditions; and in the course of the experiments doubt has been raised in his mind as to whether the average meter system is necessary to a reliable and economical determination of the volume of gas consumed in the public lamps. His object in discussing the subject is to obtain frank criticism on his conclusions, in order that the true system may be revealed.

The average meter system, as practiced in the Metropolis of London, England, is briefly as follows: Each lamp is provided with a regulator gas burner which passes a definite quantity of gas per hour under the varying pressures of the gas in the mains; and at certain lamps, carefully selected by the gas company and the local authority, meters are fixed, which record the volume of gas burned. Each month the meters are read, and after striking out the returns of those which show a variation of 10 per cent. over or 10 per cent. under the theoretical volume obtained by multiplying the number of hours during which the lamps were lighted into the cubic feet per hour to which the burners are set, an average consumption is obtained for the selected lamps, and this is taken as the consumption for each lamp throughout the district. The question raised is, Are the regulator gas burners sufficiently accurate to be relied upon for the quantity burned without the check of the meters?

In the following experiment an experimental gasholder and a minute clock by Parkinson were used. When the burner experimented on was fixed over the meter, it was not removed until the experiment with it was completed. In each experiment the gasholder was filled with 5 cubic feet of gas, and was not refilled during the time, so as to secure as far as practicable gas at the same temperature and barometric pressure. The increase of temperature in the gas by the increased pressure is common to all the experiments, so that they give a basis of comparison when this slight error is neglected. The water gauges on which the pressures were recorded were 4 inches below the regulators. The regulator gas burners experimented on were bought in the open market without the knowledge of their makers, so as to avoid specially prepared burners; and it is possibly due to this that the results obtained present discrepancies. The names of the makers are not stated, for obvious reasons. The aim of the tests was to find out whether the regulators controlled the consumption of gas under varying pressures at the volume to which they were fixed. The pressures given are water pressures; thus, 1 inch is 10-tenths pressure, etc.

Experiment 1.—Burner used was a 5-ft. fishtail common burner, said to be a "regulator," but possessing no regulating apparatus whatever. The figures under the pressures give the number of cubic feet per hour:

	Pressures in Inches.							Averages.
	1	1.5	2	2.5	3	3.5	4	
A.....	7.12	8.85	10.70	11.55	12.82	13.52	14.55	11.30
B.....	6.55	7.67	10.12	10.82	12.00	12.65	13.30	10.44
C.....	6.58	7.86	10.17	10.75	11.85	12.95	13.87	10.57
Aver'ges	6.75	8.13	10.33	11.04	12.22	13.04	13.91	10.77

These results show that the burners are not regulators. The vertical column of averages shows the greatest variation to be 7½ per cent. The horizontal column of averages shows that the burners at 1 inch pressure passed 35 per cent., and at 4 inch pressure 178 per cent. more gas than they were marked to do.

Experiment 2.—Burner used was a 6-ft. batwing common burner, said to be a "regulator," but possessing no regulating apparatus whatever.

	Pressures in Inches.							Averages.
	1	1.5	2	2.5	3	3.5	4	
A.....	8.87	11.05	12.87	13.77	14.77	16.25	16.70	13.47
B.....	7.70	10.03	11.50	12.75	14.10	14.95	16.22	12 46
C.....	8.40	10.85	12.20	13.20	14.52	15.50	16.55	13.03
D.....	9.38	11.52	12.42	13.65	15.00	16.10	17.90	13.71
Aver'ges	8.59	10.86	12.25	13.34	14.60	15.70	16.84	13.17

The vertical column averages show the greatest variation to be 9 per cent.; the horizontal column averages show that at 1 inch pressure the burners passed 43 per cent., and at 4 inch pressure 181 per cent. more gas than they were marked to do.

Experiment 3.—Burner used was a 5-ft. public lamp regulator burner with a regulating apparatus.

	Pressures in Inches. 1	1.5	2	2.5	3	3.5	4	Averages.
A.....	5.82	5.51	5.55	5.47	5.36	5.16	4.98	5.41
B.....	5.33	5.30	5.23	5.17	5.08	4.85	4.60	5.08
C.....	5.43	5.47	5.31	5.15	5.05	5.03	4.85	5.18
Aver'ges	5.52	5.43	5.36	5.26	5.16	5.01	4.81	5.22

The vertical column averages show the greatest variation to be 6 per cent., and show carelessness in manufacture. The horizontal column averages show that at 1 inch pressure the burners passed 10.4 per cent. more, and at 4 inch pressure 4 per cent. less gas than they were marked to do, or a total variation of 14.4 per cent. They also show that the regulating apparatus checks the waste of gas at increased pressures, but that the burners are not true regulators, for the volume of gas passed falls off gradually as the pressures increase.

Experiment 4.—Burner used was a 4-ft. public lamp regulator burner with a regulating apparatus.

	Pressures in Inches. 1	1.5	2	2.5	3	3.5	4	Averages.
A.....	4.27	4.57	4.47	4.48	4.45	4.47	4.47	.445
B.....	4.18	4.35	4.37	4.32	4.25	4.35	4.36	4.31
C.....	4.33	4.43	4.50	4.40	4.41	4.40	4.37	4.41
D.....	3.95	4.06	4.11	4.32	4.22	4.06	3.87	4.08
E.....	4.30	4.31	4.29	4.32	4.28	4.30	4.12	4.28
F.....	4.31	4.35	4.40	4.40	4.37	4.37	4.38	4.37
Aver'ges	4.22	4.34	4.36	4.37	4.33	4.32	4.26	4.32

The vertical column averages show the greatest variation to be 9.25 per cent., and show considerable carelessness in manufacture. The horizontal column averages, which reveal the reliability of the principle of the regulating apparatus, show that at 1 inch pressure the burners passed 5.5 per cent., and at 2.5 inch pressure 9.25 per cent. more gas than they were marked to do. A study of the figures will show that the regulating apparatus is a good one, although not perfect. The consumption of gas increases with the pressure from 1 in. to 2½ in., and decreases from 2½ to 4 in.; but, taking the average of the experiment as a standard, the burners show an excess consumption of 1.15 per cent., and a deficient consumption of 2.3 per cent.—which is a good result.

Experiment 5.—Burner used was a 4-ft. public lamp regulator burner with a regulating apparatus.

	Pressures in Inches. 1	1.5	2	2.5	3	3.5	4	Averages.
A.....	4.18	4.35	4.35	4.33	4.28	4.28	4.32	4.30
B.....	4.35	4.48	4.56	4.52	4.68	4.63	4.52	4.53
C.....	4.23	4.30	4.32	4.32	4.33	4.37	4.33	4.31
D.....	4.13	4.18	4.31	4.30	4.20	4.27	4.22	4.23
E.....	4.22	4.30	4.37	4.35	4.40	4.37	4.12	4.30
F.....	4.41	4.47	4.57	4.65	4.63	4.63	4.80	4.59
Aver'ges	4.25	4.35	4.41	4.41	4.42	4.42	4.38	4.38

The vertical column averages show the greatest variation to be 8 per cent., and show considerable carelessness in manufacture. The horizontal column averages show that at 1 in. pressure the burners passed 6.25 per cent., and at 3 in. pressure 10.5 per cent. more gas than they were marked to do. They also show that the regulating apparatus came somewhat slowly into action, but that for pressures of 1½ in. and upward it is as near perfect as can be expected; the variations from the average not exceeding 1 per cent. on either side.

Experiment 6.—Burner used was a 6-ft. household regulator burner with a regulating apparatus.

	Pressures in Inches. 1	1.5	2	2.5	3	3.5	4	Averages.
A.....	6.57	6.60	6.70	6.57	6.27	6.17	5.67	6.36
B.....	6.57	6.60	6.65	6.63	6.57	6.30	6.10	6.49
C.....	6.18	6.51	6.62	6.78	6.51	6.55	6.46	6.52
D.....	6.16	6.41	6.62	6.50	6.30	6.31	5.80	6.30
E.....	6.27	6.51	6.63	6.71	6.60	6.51	6.15	6.48
F.....	6.26	6.30	6.55	6.62	6.37	6.23	5.80	6.30
Aver'ges	6.34	6.49	6.63	6.64	6.44	6.34	6.00	6.41

The vertical column averages show the greatest variation to be 3.4 per cent. The horizontal column averages show that at 1 in. pressure the burner passed 5.7 per cent., and at 2.5 in. pressure 10.7 per cent. more gas than they are marked to do.

A number of other experiments were made, but they do not present new features, except the one which tested the burners to discover the pressures at which the regulators came into action. None of the regulators came fully into action at a pressure below 6-tenths of an inch, and most of them at 8-tenths.

The net results of the experiments given is that regulator gas burners can be made which will not vary in their consumption of gas at pressures varying from 1 in. to 4 in., more than 1.15 per cent. fast and 2.3 per cent. slow of their average consumption. All that is necessary, therefore, is to get the regulator accurately set, and its limits of error are known. The Metropolis Gas Act, 1859, defines a meter as correct which does not register more than 2 per cent. fast and 3 per cent. slow. The gas-room tests given herein show that regulator gas burners can be made as correct as gas meters.

The question now arises, Do regulator gas burners in use on public lamps, where exposed to all weathers, temperatures, and barometric pressures, give equal results to those found in the testing room? The writer is honored by Mr. Philip Monson, the gas superintendent for the parish of Kensington, placing at his disposal the results of the average meter system for 11 years. Each lamp has a regulator burner set to burn 4.5 cubic feet per hour. The meters are read each month, and the records have been carefully collected. More than 4,000 lamps are in lighting on the meter system. The following table shows the average consumption per lamp per hour for each of the 11 years:

1877.....	4.55	cubic feet	per lamp per hour.
1878.....	4.57	"	" "
1879.....	4.50	"	" "
1880.....	4.43	"	" "
1881	4.46	"	" "
1882.....	4.50	"	" "
1883.....	4.48	"	" "
1884.....	4.49	"	" "
1885.....	4.49	"	" "
1886.....	4.52	"	" "
1887.....	4.54	"	" "
11)49.53			
Average....	4.503	cubic feet	per lamp per hour.

These results are a convincing proof that regulator gas burners may be relied upon in actual use. The writer has compiled the following table from Mr. Monson's records, showing the average consumption per lamp per hour for each month of the 11 years:

January.....	4.38	cubic feet	per lamp per hour.
February.....	4.51	"	" "
March.....	4.45	"	" "
April.....	4.53	"	" "
May.....	4.49	"	" "
June.....	4.61	"	" "
July.....	4.60	"	" "
August.....	4.53	"	" "
September.....	4.53	"	" "
October.....	4.49	"	" "
November	4.50	"	" "
December.....	4.39	"	" "
12)54.01			
Average....	4.501	cubic feet	per lamp per hour.

It will be noticed from this table that the lowest consumption occurs during those months when the hours of lighting are longest, and that this gives an advantage to the local authority if the average meter system is adopted. The following table, based on 4,300 hours' lighting per year, shows the amount of this error:

Month.	Hours of Lighting.	Cu. Ft. per Hour.	Total Cu. Ft. per Lamp.
January.....	484.03	4.38	2120.0514
February.....	397.75	4.51	1793.8525
March.....	375.58	4.45	1671.3310
April.....	303.90	4.53	1376.6670
May.....	260.41	4.49	1169.2409
June.....	224.52	4.61	1035.0372
July.....	246.30	4.60	1132.9800
August.....	294.01	4.53	1331.8653
September.....	341.90	4.53	1548.8070
October.....	414.67	4.49	1861.8683
November.....	454.95	4.50	2047.2750
December.....	501.98	4.39	2203.6922
Totals.....	4300.00	4.50	19,292.6678

If the consumption had been taken from the burners alone, it would

have stood at 4,300 × 4.5 = 19,350 cubic feet per lamp per year, as against 19,292.6678 cubic feet given by the meter, or an error in favor of the gas company of 57.3 cubic feet per lamp per year. In London the price of gas to public lamps north of the Thames is 2s. 2d. per 1,000 cubic feet; so that the saving to the local authority for gas by the average meter system is 1¼d. per lamp per year.

Against this there is the cost of the average meter system. The following figures refer to a district containing 4,000 lamps, with a meter to every 20 lamps:

Capital Expenditure.	
200 meters fixed complete, at £7 10s. each....	£1,500 0 0
Annual Expenses.	
Interest, depreciation, and repairs on meters, 10 per cent on £1,500	£150 0 0
Man's time reading meters, 12 weeks per year, at 25s. per week	15 0 0
	£165 0 0

This cost, divided over 4,000 lamps, equals 9.9d. per lamp per year, which is incurred to save 1.5d. per lamp per year.

The figures given refer to a district where the minimum parliamentary limits of pressure are 10-tenths from sunset to midnight, and 6-tenths from midnight to sunrise. As a matter of fact, however, the actual pressures are in excess of these limits. From the continuous recording pressure gauge in the testing room at Chelsea it is found that the pressure does not get below 1.2 in. at any part of the day, and that from one hour before sunset to half an hour after, the pressure rises to 3 in., and even more, and then gradually falls to 1.4 in. by midnight. Where pressures like these are given the writer is of opinion that the average meter system is an unnecessary check and expense. It may be that in small districts the pressures fall below those stated as the parliamentary limits, and in such cases the regulator burners will not pass their full quantity.

Latest Improvements in the Gas Balance.

By Frederick Lux.

[A paper read at the June meeting of the Gas Institute, and printed in the Journal by request of the author, to whom we are indebted for the illustrations.—Ed.]

At the meeting of the Institute in Glasgow last year, I had the pleasure of giving you a detailed description of my apparatus for the determination of the specific gravity of gases—the "gas balance." Having since then modified and perfected the apparatus in several respects, I once more venture to trespass upon your indulgence by laying before you a few new facts connected with this matter.

You will perhaps remember that the receiving vessel for the gas in my former apparatus—models A and B—consisted of a glass globe, holding 1-15th of a cubic foot. I have now replaced the glass globe by a brass sphere to contain only 1-30th of a cubic foot, or of one-half the capacity of the former; thereby securing two advantages—viz., a decreased liability to fracture, and the possibility of exchanging the gases in one-half the time which this operation previously required. The bores, moreover, in these new models C and D (Figs. 1 and 2) have been made wider; so that by this arrangement the outflow of the gas is both easier and quicker—the result being that, with these new models, only from 3 to 5 minutes are required to replace the total contents of the globe by fresh gas, which operation, in models A and B, took fully from 10 to 12 minutes to accomplish.

In order to give facilities for testing at any time the temperature and pressure of the gas in question, I have added, in convenient places, thermometers and manometers; and as the apparatus is intended to be used in all parts of the manufacture of gas, I have inclosed it in an oak case, which is glazed over, and capable of being put under lock and key. It is thus perfectly safe from dust, from being tampered with, etc. The case is supplied with a spirit level and regulating screws, so that the balance can at any time be examined as to its horizontal position. A thermometer and barometer fixed inside the case serve for the determination of the temperature and the pressure of the air. In model C (with gas supply and outflow), only the front side of the casing can be opened; but in model D (with gas supply and burner pipe), the lid is also arranged for opening. As the case in apparatus D must be opened while the apparatus is at work, and in model C it may remain shut, the latter deserves the preference. The four models mentioned give the specific gravity exactly to within .01, and are, therefore, sufficiently accurate for ordinary everyday use.

For calculations requiring greater accuracy I have constructed model E (fig. 3), which, in several respects, differs from the other apparatus. The balance rests, not on points, but on an edge, and is so arranged that, while the apparatus is not in use, the edge is lifted off the bearing, and in whatever position the balance may happen to be, it can be retained there. For the purpose of avoiding the large angular movements experienced in the case of the other apparatus, I have furnished the balance with a weight, which can be shifted to and fro on the beam; the

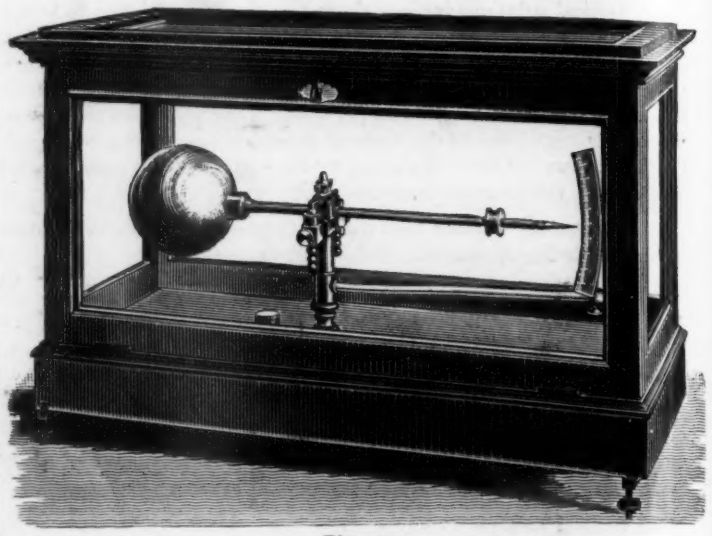

Fig. 1.

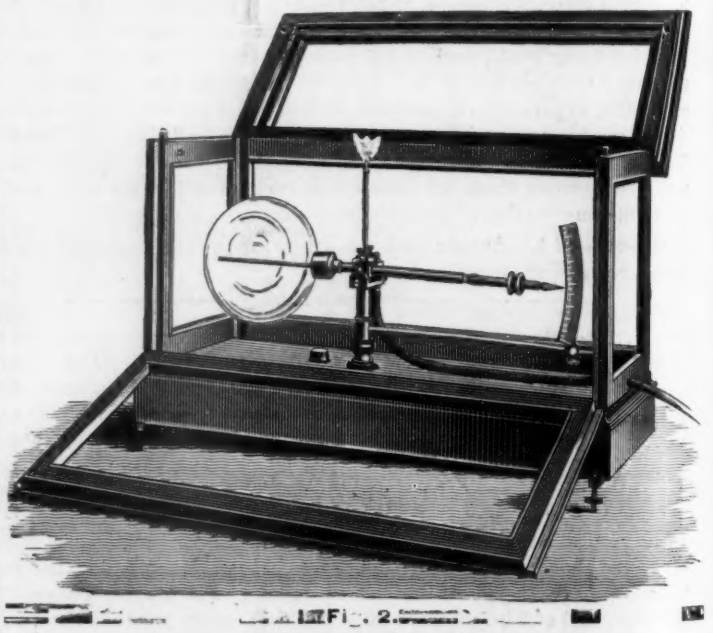

Fig. 2.

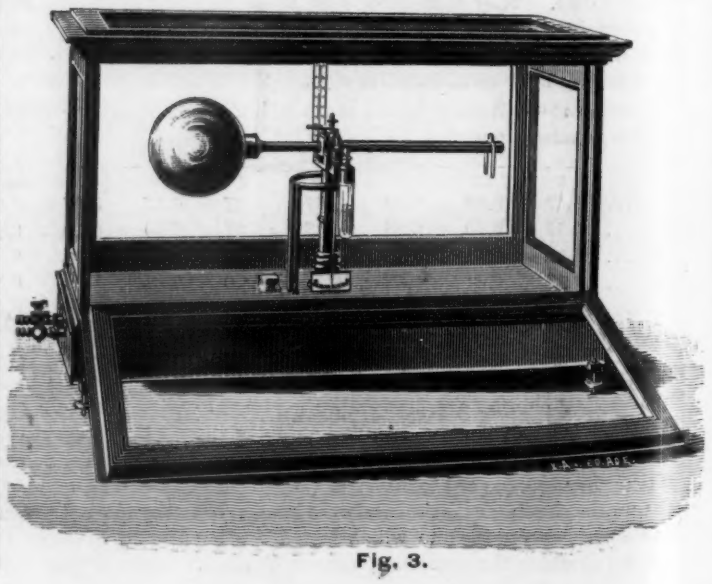

Fig. 3.

division marked upon the beam giving the first two decimal places, while the pointer of the balance, moving in a graduated arc, which is fitted somewhere below, indicates the third decimal place. We may,

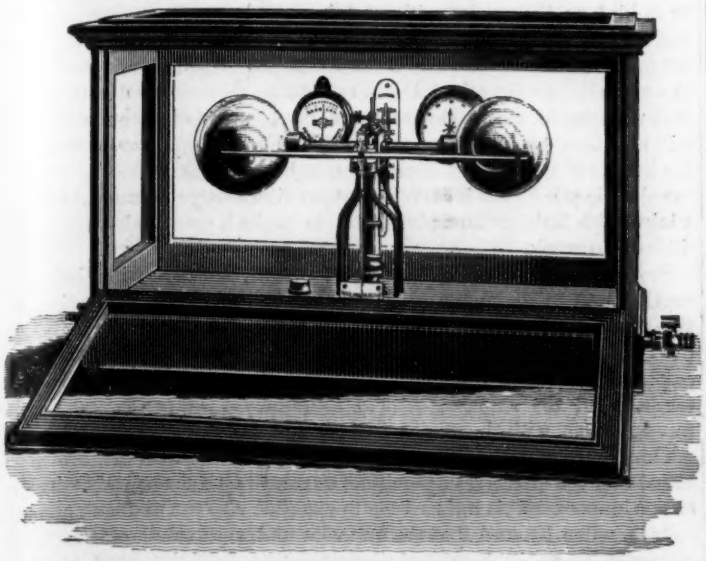

Fig. 4.

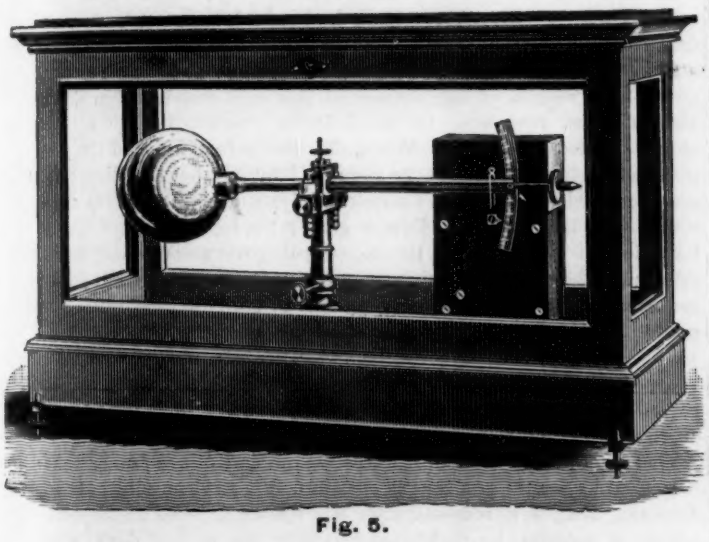

Fig. 5.

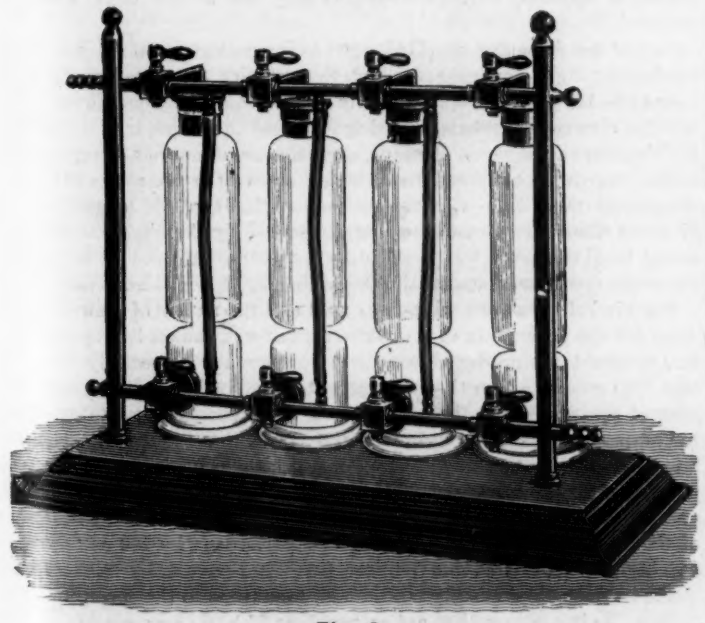

Fig. 6.

with the aid of this balance, determine the specific gravity of any gas to within .001. In every other respect the balance is fitted up exactly like the other apparatus.

Model F (Fig. 4) is intended for determining the constituents of gaseous mixtures—as, for instance, the quantities of carbonic acid and sulphuretted hydrogen present in illuminating gas. The beam carries on each side a brass globe, which serves as a receiving vessel. The gas to be examined flows first through one globe, and then through an absorbing or purifying vessel, in which, to mention one example, the carbonic acid may be retained; and, further, through the second globe. The change in the specific gravity, made by the elimination of one constituent, is commensurate to its quantity. As with gases of an average specific gravity of .5 one per cent. of sulphuretted hydrogen causes a difference in specific gravity of .006, and one of carbonic acid a difference of .01, and as, moreover, the balance is capable of accurately indicating a difference of .001, the sulphuretted hydrogen in ordinary illuminating gas can be determined to within 1-6th per cent., and carbonic acid to within 1-10th per cent.

In conclusion, I wish briefly to refer to model G (5), which is capable of automatically registering the specific gravity of gases during their passage. In this self-registering apparatus we cannot, of course, expect a connection with any writing apparatus, for the simple reason that a difference of .01 in the specific gravity of gases corresponds to a difference of only about 1-5th of a grain in weight. The marking, on the contrary, is done by photographic means; the higher or deeper position of the beam being registered by a ray of light (which passes through a bore of the beam) upon a strip of sensitive paper. This paper, by means of clockwork, is moved along in a dark casing, and is slowly drawn across a narrow slit.

By means of an apparatus of this kind I have succeeded in marking the specific gravity of gas in gas works, and the registrations obtained (see Fig. 7,) actually indicate the variations which result from the operation of filling the retorts. We may, therefore, anticipate that this apparatus will show its usefulness in controlling the working of furnaces, etc.

Of additional apparatus, specially constructed for use with the gas balance, I may mention the gas filter, which can be utilized for the retention of water and tar in crude gas, of particles of dust, etc., in generator and fire gases. There is also an apparatus (Fig. 6) for absorbing moisture, carbonic acid, sulphuretted hydrogen, etc.; and, lastly, an appliance for the cooling of hot gases.

Allow me to add that the gas balance, in ordinary working, has proved a very useful apparatus; and Mr. W. A. Valon, of Ramsgate, among others, has given a very favorable account of its practical value.

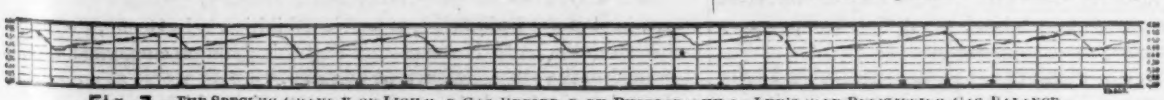

Fig. 7.—The Specific Gravity of Lighting Gas Recorded by Photography in Lux's Self-Registering Gas Balance. Duration of Experiment, 24 hours; Gas taken off after passing the Station Meter.

The Comparative Danger of Alternate and Direct Electric Currents.

[A paper read by Dr. P. H. Van der Weyde, at the New York convention of the National Electric Light Association.]

It is only a few days ago that I received the flattering invitation to appear before this meeting of the most eminent electricians of the United States, and present a paper containing my conclusions about the comparative danger to life lurking in the alternate and direct dynamo currents. I do so readily, as I have lately had the opportunity to become acquainted with the arguments made on both sides of the question. I was not prepared to do so when, a few months ago, I attended a meeting of the New York Board of Electrical Control, where several papers were read, most of them in opposition to Mr. Harold P. Brown, who had expressed himself against the use of the alternate current system, of which the introduction has lately been commenced. When the President of that meeting asked me to express my opinion I was in the necessity to decline, stating that my appearance there was solely intended to listen to arguments upon the subject about which I desired full information.

As some of the papers read there were written in such a spirit as to compel Mr. Brown to defend himself, I made up my mind to attend his expected defense, especially as it might give me an opportunity to hear what powerful arguments and facts would be brought out by the person who has put himself forward as the champion of the enemies of the alternate current system. It makes always a painful impression upon me when I see that a scientific investigator feels the necessity to defend himself against personal attacks. The call-

ing of the scientist should simply be confined to ascertain what is the truth; if he thinks to detect erroneous conclusions arrived at by any co-laborer it is his duty to expose them. At the same time we must mind the old rule, *suaviter in modo, fortiter in re;* therefore, above all he must let the facts speak for themselves, avoiding any allusion regarding the capabilities or ulterior motives of his antagonist; in short, he must leave the use of all personalities to the politicians; for these the main considerations are persons, principles are secondary, and may be changed to suit circumstances, or thrown overboard entirely. In science, however, we have to the contrary nothing to do with persons, but only with the ultimate truth, which we are all striving to arrive at.

At a recent visit to the physical lecture room of Columbia College, where I had been invited by telegram to hear the reading of a paper, and a lecture illustrated by experiments by Mr. Harold P. Brown, the feeling referred to above was more painful to me than even the howling of the dog experimented upon. Dogs have for so many years been considered as the poor legitimate martyrs of science, especially under the hands of physicians and professors of physiology, that we have become more or less hardened in their regard. Nobody will deny the immense value of the increase of our biological and especially pathological knowledge obtained in this way.

A great portion of the paper read by Mr. Brown consisted in complaints about the personal attacks made upon his capability, as soon as he asserted in print that the alternate electric currents were more dangerous to human life than the direct currents, namely: that a current of the electromotive force of, say, 300 volts, alternate current, would be more likely to destroy life than double or triple that strength of a direct current.

One feature was prominent in the reading of the paper as well as in the lecture and experiments; it was evident that the purpose was not so much to exhibit what was the truth in the matter as to show that he was right in what he had asserted.

He attempted to prove this by experimenting upon a large dog, which, when subjected to a direct current, stated to be 300 volts, set up a short howl; 600 volts produced a longer howl and frantic efforts to escape from the cage, while a current of some 900 volts paralyzed the dog, who kept up a labored breathing. Then a representative of the New York Society for the Prevention of Cruelty to Animals interfered, and forbade further trials of this kind, so that Mr. Brown was compelled to give the dog the *coup de grace* by applying the alternate current, which he stated to be of the strength of only 300 volts.

Unfortunately for Mr. Brown, this proved nothing, as the dog was already half dead by the previous successive and increasing direct current doses of 300, 600 and 900 volts respectively. Another dose of 300 or 600 volts direct current might, in all probability, have ended his life just as well. But what is more, his statement that the alternating current was merely 300 volts was not proved, as he himself had stated previously that reliable instruments for measuring alternate currents were difficult to obtain, and confessed that he had only a voltmeter for this purpose but no ammeter. After the lecture I examined the voltmeter, and found that according to the statements of Mr. Brown, its operation was based upon indications of rise in temperature.

Now, it is well known that rise of temperature is not produced by electromotive force, but by amount of current; one Wollaston plunge battery cell, of one square meter acting surface, having, of course, the electromotive force of only one single volt, will produce far more heat than a series of 24 freshly-prepared cups of a Leclanche battery of 40 volts electromotive force. This voltmeter was perhaps a kind of ammeter.

This was the opinion of Professor G. Forbes, from England, who last year exhibited to the Society of Electrical Engineers, in New York, a meter for alternating currents; he did not call it a voltmeter, because its operation was also based upon rise of temperature, but he called it a current meter. This meter was described and illustrated on page 1 of the *Electrical Review*, for Oct. 8, 1887, where there is added a little table giving the observed currents in amperes. Immediately under that table follows the statement that Sir William Thomson complimented the author on having practically solved a problem on which he himself had been working without satisfactory results, thus endorsing the instrument as a current or ampere meter.

If, however, such an instrument is carefully guaged in regard to resistance, so as to satisfy the formula volt = am. × res., it may be converted into a voltmeter; but instruments of this kind are not always properly gauged in this way, and are frequently unreliable.

And here I cannot let the opportunity pass by to repeat what I have been preaching for years, namely, that the voltage alone is no criterion in regard to the dangerousness of a current; the danger comes only when the electromotive force (as measured in volts) is accompanied by a sufficient quantity or volume of current (as measured in amperes). An electromotive force carrying a current of only a few micro-amperes may be as high as 1,000 volts without doing any harm (even when alternating, as proved by the Rhumkorff coil). It behaves like water oozing out of a pinhole under pressure of hundreds of pounds; it can do little or no work. At the other side, a very large volume or quantity of current with small electromotive force, of, say, a small fraction of a volt, will not have the power to pass through the human skin, or even through the liquids of the body, but only through metals (as proved by the thermo-electric pile.) Such currents behave like a large volume of water in a lake, with little or no inducement to make it move; also this will do little or no work.

Professor Mayer, of the Stevens Institute, Hoboken, in a lecture recently given to the members of the electric section of the American Institute, exhibited some novel experiments, intended to measure, if possible, the voltage of static currents. He used an old-fashioned friction electric machine, and showed that the voltage of its currents ran into the thousands, while the amperes were so minute as to escape the possibility of measurement, with the means thus far at disposal.

This leads me back to the subject of the experiments of Mr. Brown; he stated that the quantity of the direct current he used was only a fraction of one ampere. This induced me to examine also the ammeter after the lecture, when I found that the ammeter and voltmeter were coupled together in series in the same single circuit. I did not see any switches connected therewith, so as to shunt out the high resistance of the voltmeter when the current was applied, as is frequently customary; therefore I concluded that the direct current had the benefit of being moderated by this resistance also, which benefit was not given to the alternating current for reason of the absence of this high resistance in its circuit, and in place, therefore, the much lower resistance of the alternating ammeter referred to above. When after the lecture I visited the dynamo plant of Columbia College to inquire, I found that the direct current machine used was an Edison municipal dynamo of 15 amperes and 1,200 volts. It is likely that Mr. Edison gave it the name of municipal in anticipation of the fact that the municipal governments will need such machines when the new law in regard to capital punishment and of despatching criminals by electricity instead of hanging goes into operation next year. If so, it is very suggestive, in regard to the controversy we are discussing, that such an able electrician as Mr. Edison is satisfied that a direct current dynamo is all that is needed for that purpose without regard to the alleged greater effectiveness in this respect of the alternate current dynamos.

This dynamo did not belong to the Columbia College plant, but it was furnished by Mr. Edison for the occasion, as well as an alternate current dynamo. Both were removed after Mr. Brown finished his experiments, which, it appears, he continued privately for a few days after the lecture.

One of the dynamos used belonged to the college plant; it was an incandescent light dynamo, of which the capacity was stated by the engineer to be 125 amperes and 110 volts. This dynamo was employed to obtain the alternate currents, by using it to feed the magnets of a Siemens-Halske alternate current machine, after the usual manner, as represented in the engraving exhibited here, which shows the essentials of the arrangement used, only with this difference, that the field magnets of the Siemens alternating machine were supplied by the direct currents obtained from the much larger 125-ampere dynamo referred to, in place of the small one represented in the engaaving, at the right hand side below.

The kind of apparatus which was used and the nature of their arrangement for the production of the alternate current, makes it very unlikely that it would not produce a considerable current. Especially when we take into consideration that the current developed must represent some kind of equivalent for the horse power required. Firstly, to drive the 125-ampere incandescent light dynamo; next, that required to drive the alternate current dynamo; the latter must have consumed considerable power, as the 125-ampere current was more than sufficient to saturate its great number of stationary electro-magnets. According to the statement of the engineer the engine driving the 125 ampere by 110 volt dynamo was of 36 h. p., but as this dynamo furnished only 125 x 110, or 13,750 watts, its duty, theoretically considered, amounted to the consumption of 19 h. p., so it appears that not as much as 36 h. p. was consumed. If we make allowance for the ratio of useful effects of Edison's dynamos as determined at the Philadelphia electric exhibition to be 90 p.c., we will not be far from the truth if we assume that this dynamo consumed 21 h. p. In regard to the alternate current dynamo, we may arrive at an estimate by knowing the fact that the other steam engine which previously drove the direct current municipal 1,200 x 15 or 18,000 watt dynamo consumed

theoretically 24 h. p., but making again allowance for the 90 p. c. useful effect as before, we obtain nearly 27 h. p. As it appears that this very steam engine drove afterwards the alternating current machine, with the same velocity and steam pressure, we obtain the total amount of 27+21, or 48 h. p. required for the generation of the alternating current. This corresponds to the production of 35,808 watts. Assuming a current strength of 30 amperes, it would give 1,193 volts; for 15 amperes 2,387 volts.

Of course, this is an exaggerated estimate, but sufficient to show the underestimate of the figures as given by Mr. Brown. In order to come to correct conclusions it would be necessary to measure, by means of indicator diagrams, the engine power utilized, and measure the currents obtained by proper instruments, properly used and conscientiously observed.

But in fact it is scarcely necessary to go into any calculation to make it evident that the alternating current obtained must have been double that of the direct current, when we consider that for the direct current one steam engine and one dynamo was used, while for the production of the alternating current two steam engines and two dynamos were employed.

One thing is certain, namely, that the dynamos used were not of such a defective quality as to warrant the supposition that this would not be the case, and the acknowledged absence of proper measuring instruments for alternating currents, connected with the fact that the estimate of the current strength which was switched in the circuit applied, appear to have been based upon the same amount of rheostat resistances, as had been used for the direct current, makes it very probable that the voltage of the alternating current was twice as high, if not more, than estimated by Mr. Brown.

There was added on the lecture room table another important additional (however small) contrivance, for the right understanding and use of which I will have to make a short introductory explanation. I do this also because I have been especially requested to do so by several parties who had become interested in the operation of this, to them, very novel device.

I must ask pardon for bringing some elementary considerations before this learned body, but my apology is that this paper will be published, and will be read by many who are not so well informed about electrical subjects, and whose ideas upon it need some clearing up.

Everyone who has handled faucets attached to pipes from which water can escape under pressure, will have noticed that when suddenly shutting off the water a blow like that of a hammer is produced in the pipes. This is caused by the momentum of the water when in motion (often very improperly called inertia), and which shows itself every time this motion is arrested. On this peculiarity is based a contrivance in which, by the automatic alternate opening and closing of a valve a small portion of the water discharged may be raised to a greater height than that of the original device which produced the pressure. This contrivance has been called a hydraulic ram, and by its help an increase of pressure may be obtained at the expense of a certain quantity of water.

Notwithstanding electricity is not a fluid like water, it behaves, however, also in this case, in a similar manner; at the moment a uniform electric current is interrupted, a current of greater electromotive force (more pressure) is developed in the conductor, and will show itself as a spark at the break of contact, and as a shock through the body when the hands have hold of the wires when the contact is broken. It is a very old observation, and one of the earliest reminiscences of my boyhood (about 1823), that the current of a column of volta of, say, 30 pairs of plates, scarcely perceptible when closing the circuit through the body, will give quite a sensible shock when breaking the circuit. Such currents have been called extra currents, and they are, of course, stronger in proportion to the strength of the original current, and still further increased by inductive influences when there are coils in the circuit.

As it may be desirable for special purposes to eliminate these currents, an apparatus has been invented which operates like a very sensitive relay, and then leads these currents off, or shunts them into another channel after the manner of lightning protectors. Such an apparatus was on the table during the experiments with the dog, and appeared to be intended to protect the animal against the effect of these extra currents. I must confess not to see why this was done, except for the purpose to annul the most powerful and most dangerous item connected with the direct current. Therefore I consider the addition of this contrivance improper if we wish to arrive at the truth in regard to the comparative danger of the alternate and direct currents, because in case of accidental exposure of person there is rarely such a safeguard inclosed in the circuit, and the person struck by the current must submit to the extra current as well.

In order to arrive at the truth of the matter we must also, above all, be able to make definite statements about the voltage and the volume of current, based on precise measurements, which, in regard to the alternate currents, could not be furnished, but was only guessed at.

Finally, as far as I can judge about the matter, guided by the present state of knowledge (especially in regard to some, in many respects, still unexplained peculiarities in the behavior of alternate currents), I should say that their true voltage must be quite high. They do not behave like currents of low voltage (say, 300 or 400) as they can be, and practically are, conducted over much longer lines and thinner wires than is the case with the direct currents of, say, 1,000 volts. This fact is acknowledged as well by the enemies as by the friends of the alternating current system. Experiments made with converters, especially with a new and very peculiar one of my own construction, appear also to show that there must be considerable voltage in the alternate currents so as to account for the generation of the enormous volume of current into which the electromotive force is converted; in other words, for the thousands of amperes obtained by the conversion of the volts of the primary current, and for which amperes there is no ammeter yet to measure them; but their volume shows itself in the capacity to perform operations requiring the highest temperatures, such as welding iron, fusing the most refractory substances, etc.

Surely no dynamo could be constructed directly generating a current of such volume as it would destroy itself by the heat of its own current; it is only by alternating current machines of high voltage, assisted by proper converters, that currents of such great volume and high caloric capacity can be obtained.

I am satisfied that the alternating current dynamo has a great future before it, not only for electric illumination, but also for motive power, metallurgical, and probably even electrolytical operations.

After all, we must not lose sight of the main objects of this controversy, which is the comparative danger lurking in the two systems. Were it found by experience that actually the danger of being killed is greater by the use of alternate currents, it does not make any difference if the voltage which does the killing is 300 or 1,300.

When, however, we consider that statistics show that the loss of life by the direct current system is continually increasing in proportion that the system is extending, the probabilities appear to be that both systems will furnish their equal quota of victims, and the labor of comparing the relative danger of both systems, and especially the discussion about their comparative voltage, appears to become an idle occupation.

Those who favor the burial of all electric light wires underground out of sight overlook the difficulty to keep them out of reach also; namely, at their connection with the overground lights. This is no doubt easier with the existing system of overhead wires when placed all out of reach, while the sufficiently protective insulated covering may as well be applied to such wire, as is the case with the underground lines.

The agitators who want legislative interference against the use of high tension dynamos should be consistent, and if the protection of human life *is their real motive*, they should attempt to obtain also legislation against the manufacture and use of high tension dynamite, nitro-glycerine, and other similar explosives; also against the use of gasoline lamps, burners and stoves, all of which produce almost daily their quota of victims. Further, against horse and foot races, rowing and swimming matches, base and foot-ball games, athletic sports, etc. Each of these have from time to time produced more accidents and loss of life than is the case with the electric light currents, about which it appears to be the fashion to make a great fluster when occasionally a life is lost, while the killing of a baseball player or jockey attracts scarcely any notice.

The opposition of the alarmists who predict terrible disasters from the introduction of alternate electric currents, reminds me forcibly of the predictions made less than one century ago, when the world was warned against the introduction of illuminating gas and railroad trains. About gas it was prophesied that it would blow up cities, or destroy them by universal conflagrations, and that railroads would cause the indiscriminate and wholesale slaughter of the reckless individuals who dared to tempt Providence by trying to travel with the enormous velocity of 20 miles an hour. But the gas and the railroads have come to stay, and so will the high tension currents. The progress of the world cannot be impeded and much less arrested by a few timid alarmists.

THE oil pipe line between Lima and Chicago has not realized the expectations of its projectors, the pumps at the Lima end having proved inadequate to the duty imposed on them. It is hoped that the erection of an intermediate pumping and storage station at Laketon will solve the problem. Work has been commenced on the auxiliary plant.

SPECIAL ENGLISH CORRESPONDENCE.

COMMUNICATED BY NORTON H. HUMPHRYS.

SALISBURY, Sept. 13, 1888.

Gasholders Without Guide Framing.—New Gas Analysis Apparatus.—Relative Cost of Gas and Oil.—The Local Government Act.—Tar and Sulphate.

At a recent meeting of the Manchester District Association of Gas Engineers Mr. Thomas Newbigging read a paper* descriptive of one of the most remarkable inventions, so far as originality is concerned, that have been made in connection with the manufacture and storage of gas since the introduction of the exhauster. I allude to the "Manchester patent gasholder," invented by Mr. Wm. Gadd, of Manchester. It is stated that one of the largest gas engineering firms in the country has offered £20,000 for the patent rights, and been refused, the proprietors rating them at a much higher value. The advantage gained is the doing away with columns, guides, and top swan necks, the Manchester patent gasholder being supported from the bottom entirely. Mr. Newbigging showed in his paper that of the total weight of iron employed the columns and girders represent about one-half in a single lift, and more than that proportion in a telescopic holder, and this gives an idea of the economy that would be effected if Mr. Gadd's invention proves successful. It will be remembered that the possibility of dispensing with guide framing on the exterior of the tank has been under discussion for some time. A paper on the subject was read at the 1887 meeting of the Gas Institute, by Mr. W. H. Y. Webber, of London, and Mr. G. Livesey has just tried a practical experiment by dispensing with the guide framing so far as the upper lift of a three-lift telescopic holder is concerned. Mr. Webber's idea was to duplicate and strengthen the bottom rollers, and add tangential rollers at that part. Mr. Gadd uses tangential rollers at the bottom only, working on T or channel iron guides fixed in the tank; but the strikingly original part of his invention is the idea of fixing the guides at an angle, say, of 45°, instead of perpendicularly. The effect of this arrangement is to give the guides the form of a screw thread, and the holder, instead of rising and falling vertically, revolves on its axis to a degree dependent upon the pitch of the guides. If these were set at an angle of 45° inclined to the right the holder would revolve to the right through an arc equal to the depth of the tank in rising, and turn back again to a corresponding extent in falling. It is claimed that, whereas the perpendicular guides prevent horizontal motion, but are no check against a moderate amount of tilting in a perpendicular direction, the inclined guide secures a gripping or locking action, which prevents either horizontal movement or perpendicular tilting. That it gives the holder a firm hold upon the tank walls, as effective, in fact, as if the vessel was fastened down to the ground all round. As all who are interested in this question will read the paper and the discussion thereon for themselves, I do not propose to follow the subject further, although it is a very attractive one. Whatever the practical issue, Mr. Gadd deserves great credit as the author of a most ingenious and original design.

The fact that this imposing invention was first introduced at a meeting of a district Gas Managers Association naturally directs one's attention to the important and increasing influence of these societies in connection with our industry. The first meeting of the newly formed North of Ireland Association has just been held, and furnishes very interesting reading. It not only affords some useful information but gives an in sight into the local circumstances of gas managers in Ireland, and the peculiar difficulties that they have to encounter—difficulties, by-the-way, which the Gas Managers Association is just the sort of organization to cope with. It has triumphed over them in other places, and will eventually do so in the North of Ireland. A movement is also on foot for the formation of an Eastern Counties Association in England, and Welsh gas engineers have for some time had under consideration the desirability of having a local association. In this connection I also notice, with interest, that another district association is to be formed in the States.

Having directed attention some years ago to the importance of gas analysis for gas engineers, I naturally hail with pleasure the activity that has been noticeable during the last few years in the devising of new forms of apparatus, as showing that this subject is at last attracting the attention which it deserves. Mr. W. G. Hicks, Assist. Engineer of the Ramsgate Corporation gas works, has lately published a description of the apparatus used by him for this purpose in the *Gas Journal* (London.) To my mind it possesses several advantages. In the first place it is cheap. There is also an absence of fragile or complicated blown glass arrangements, capillary tubes, three-way glass cocks, and such like delicate devices, which are troublesome to keep in order, liable to be broken, and costly to replace. A reasonable quantity of gas is operated upon—about a pint and three-quarters. Possibly it may be prejudice only, but it seems unreasonable to my mind to operate on about a thimbleful of gas, and some forms of apparatus really do not deal with much more. A defect too trifling to be detected, or a very slight oversight in taking the sample, in treating, or in reading the reductions, may entirely overset the results. Mr. Hicks also arranges that most of the results can be checked by independent experiments. The double entry system is said to be a good thing in bookkeeping, and it certainly is so in chemical researches, especially when conducted by amateurs. But I think it would be better, for several reasons, if instead of taking a litre for the capacity of his gas bottle, an aliquot part of a cubic foot was selected. The metrical system may be better for scientific purposes, but so long as we retain the cubic foot, the gallon and the pound as standards in ordinary business, it is better that the experimental part should conform to them. For some years the practice in my laboratory has been to use gas bottles of one-tenth cubic foot capacity. This is within 1 per cent. of 100 fluid ounces, or $\frac{5}{8}$ pounds weight of pure water, and therefore admits of practical calculations being rapidly and simply worked out. Any gas manager who can possibly spare the time will do well to obtain either Mr. Hicks' or some other cheap and simple form of gas apparatus, and just try a few experiments on samples of gas from the hydraulic, condenser, scrubbers, purifiers, etc. A day or two so spent will give him a better insight into the operations going on under his charge than any amount of reading or talking.

Some experiments recently published, by Lewis T. Wright, seem to show that in assuming that the cheaper forms of paraffine and petroleum oil give a very much cheaper light than coal gas, as is generally done by many persons, gas engineers included, a mistake may be made. Indeed, light for light, the advantage is all in favor of coal gas, at English prices. The following are a few quotations from his figures:

Cost of Producing Light Equivalent to 100 *Candles for One Hour.*

Paraffine, at 8d. per gallon (duplex lamp)	5.6d.
Petroleum, at 1s. " "	11.0d.
" " " lamp Belge	7.9d.
Gas (Schulke burner)	2.7d.
" Wenham "	3.9d.
" Common flat flame burner	7.7d.

From these it will be seen that even the common batwing or fishtail can hold its ground fairly well, and that the improved modern burners far out-distance cheap oils, in the matter of price. The oils could not possibly be sold much lower than the above rates, as there is the cost of carriage and the retailer's profit to consider, even if the oil is obtained for next to nothing in the first place. Evidently it is not the comparative cheapness but the hawking of oil in small quantities that secures its adoption, and, therefore, a margin exists for the supply of gas in small quantities, as by the "prepayment meter," at prices that will compete favorably with the cost of oil. This is an important fact. If oil was really considerably the cheaper, light for light, only a limited degree of success could be reasonably expected to attend the endeavors now being put forth in the way of extending the use of gas among the working classes. But in the light of Mr. Wright's experiments, and bearing in mind the advantages of cleanliness, saving of risk, and absence of trouble possessed by gas as compared with oil, there is every encouragement for pursuing this line of business with energy.

An important legislative measure has just received the sanction of Parliament. It is entitled "the Local Government Act," and although as at present constituted it does not affect the legal position of gas and water companies, or the methods in vogue for obtaining statutory powers, the fact that it has been passed appears to foreshadow important changes at no distant date. The principal feature is the formation of "County Councils," consisting of Chairman, Aldermen and Councilors, who will be intrusted with the carrying out of a great deal of public business, such as assessing property for rating purposes, the testing of gas meters, the control of main roads, of the pollution of rivers, and other matters with which gas companies are concerned. They also have power to oppose bills in Parliament. A wider construction is put upon the term "County" than that usually accepted. Boroughs having a population of not less than 50,000 are to be called "County Boroughs," and will be regarded as separate counties. So that in large towns a great deal of the work that has hitherto been done at Westminster will be transferred to the local authorities. There is also an important change in connection with the affairs of small towns, for it is enacted that in small boroughs of less than 10,000 inhabitants the local authorities are to be merged in the County Council for the district. A considerable portion of the Act is occupied by special regulations for the County of London, which is to have its own County Council in the place of the present Metropolitan Board of Works.

Ante, p. 187.

A steady improvement in the prices obtained for tar has been noticeable for some months past, although there is nothing like a return to the high prices of 1882 and 1883. Still in some localities a rate of 20s. or more per ton can now be realized, at which price it is more profitable to sell the tar than to consume it as fuel. Where there is a considerable item in the way of railway carriage to pay, however, tar firing continues to be the wiser plan—provided, of course, that there is a fair outlet for the coke. Sulphate appears to be rather low just now, and I do not hear that the efforts to promote a local sale for this product have been attended with much success. The bulk is still supplied to dealers and merchants.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

THE residents of Eastport (Me.) have been on the anxious seat over an industriously circulated rumor to the effect that the works of the East port Gas Company were to be closed down when the stock of coal on hand would have been exhausted. The people did not relish this prospect, and appealed to Manager Pike for information in regard to the outlook. Their query rather amused Mr. Pike, but his answer was reassuring in that he remarked that as the sales of gas during June, July and August of this year were far in excess of similar sales in the corresponding months for many years back, he thought the Eastport works would continue to send out gas "until further notice." He also suggested that a still more liberal use of gas would speedily result in a reduced selling rate.

ONE of the great features of "Fair Week" at Buffalo, N. Y., at which time the Democratic convention was also assembled in the city, was the brilliant illumination of Main street, carried out by the enterprise of the proprietors of the Citizens and Buffalo Gas Light Companies; and praise should also be accorded the Natural Gas Company for the grand display made at the corner of Court and Main streets. This latter would have been duplicated at other points on the lines were it not for the peculiar situation of the distributing pipes at the most desirable locations. The success of the illumination was such that a repetition of it was made on the Saturday following the return of Buffalo to its normal state—that is, when the city had bid adieu to the husbandman and the politician. No charge was made by the Companies that supplied the gas, and the necessary plumbing work was also carried out under the supervision of Messrs. Krumholz and Miller. The actual expense of the latter was borne by the Buffalo Business Men's Association.

THE Thirty-Third Annual Meeting of the Jamaica Plain (Mass.) Gas Light Company was held at the Gordon street (Boston) office about a fortnight ago, and those in attendance had the pleasure of listening to an annual statement that should more than convince them that their property is being ably and intelligently managed. The net profit for the twelvemonth equaled $18,286.30, out of which two semi-annual dividends (amounting to 8 per cent.) were paid, and a snug balance was carried over to surplus. The election for Directors resulted in the choice of Messrs. Francis A. Peters, M. R. Wendell, A. J. Peters, C. F. Curtis, C. H. Wing, Fred. Seaver and E. A. Hildreth. The Board subsequently elected Mr. F. A. Peters to the Presidency, and Mr. Geo. W. Kenyon was chosen Clerk and Treasurer. Mr. Kenyon's selection was in accordance with the usual policy of the managers, who believe in promoting those who serve them faithfully. The appointee has amply demonstrated his capacity for the berth, having been in the employ of the corporation, as clerk to the former Treasurer (the late Dr. George), for about 9 years.

SUPT. JORDAN, of the Fulton Municipal Gas Company, Brooklyn, N. Y., is congratulating himself at the termination of his struggle with the mixture of mud and tidewater encountered while sinking the tank for the reception of a new holder on the Company's property to the east side of Third avenue. The tank was finished last week—and an excellent job was made of it in every respect—and the iron work is being prosecuted with vigor.

CONTRACTOR BREDEL has almost finished work under the contracts awarded him last spring by the Brooklyn and Nassau (Brooklyn, N. Y.) Gas Light Companies—in fact the Nassau benchwork will be under fire before Nov. 1st. The Toronto (Can.) contract is also pretty well along, and we suppose it is now, or soon will be, in order for Fred. to take another flying trip to the Gogebic range of lakes—a dangerous thing for the black bass of the aforesaid waters.

THE opposition tactics in Los Angeles (Cal.) have taken on a new phase, and the latest form of the conflict cannot be said to be an improvement on those hitherto employed. The old Company recently published in the local papers an article calling attention to the deadly nature of the gas that was being distributed by the Lowe Company, whereupon Prof. Lowe instituted a suit for libel against the old Company on the ground that the aforesaid article was libelous and defamatory. Damages are modestly estimated in the sum of $500,000. If we were the Professor we would not press that suit.

THE authorities of Wilmington (Del.) have awarded a contract for the lighting of the streets by gas to the Wilmington Coal Gas Light Company. The contract is to last for three years, and the rate agreed on is $17 per lamp per year if 700 lamps are maintained, a reduction of 25 cents per lamp per year to be allowed in case 800 lamps are ordered. The oil lamp awards were not made. During the discussion on the latter the representatives of the bidding companies furnished much amusement for the audience, the two Robinsons being conspicuous in the entertainment. W. F. Robinson (Wilmington) informed C. R. Robinson (of the Pennsylvania Globe Gas Light Company) that the latter was noted as a bulldozer, no matter where he went; and this remark caused the Robinson thus charged to turn on Mr. Webb (of the Baltimore Automatic, etc.) with an offer to bet him (Webb) that his light was inferior to the Globe Company's sample. An auditor audibly suggested that the bet (in case the money was put up) could never be decided, in that no expert would take upon himself to say which of the two lights ought to be awarded the palm of inferiority.

THE proprietors of the reconstructed Coshocton (Ohio) Light, Fuel and Power Company have closed a contract with the Naysmith Fuel Gas Company, of Pittsburgh, Pa., for the erection and equipment of a producer on the Naysmith system. The award was made chiefly on account of the decision of the purchasers that the Naysmith process gave better promise of success than any of the other systems that had been examined; and this assertion bears itself out, because the unsuccessful bidders submitted much lower estimates than the one that was accepted.

RECENT shipments of his adjustable coke crusher were made by Mr. Keller to the New Haven (Conn.) and the Citizens (Newark N. J.) Gas Light Companies. He has also sold drip-pump boxes to The Rathbun Company, Deseronto, Canada, and to the Indianapolis (Ind.) Gas Light and Coke Company. Those drip-pump boxes are worth examining.

AN interesting decision was recently handed down by Justice Morgan J. O'Brien, from the Supreme Court of this State, in the matter of an injunction asked for by Philip Braender, a New York builder. Complainant is the owner of a row of apartment houses on E. 122d street, which adjoin the station of the Harlem Electric Lighting Company, and he claimed that the machinery of defendant not only injured his buildings but because of the continued noise and constant jarring from its operation, he was also unable to keep the apartments tenanted. The evidence showed that the machinery or apparatus was constructed or operated in accordance with the best and most approved methods, and on this point the Judge held that it was not *per se* a nuisance; hence special injury must be shown. In regard to the latter, the Judge admitted that the evidence on the second point—the disturbance and annoyance to the tenants, and the consequent loss to the landlord, because of the operation of the machinery—was all in favor of the plaintiff, and proved a case of substantial grievance. The injunction—with an extended time allowance for its initial effectiveness—was ordered, the extension being granted because it had been shown to the satisfaction of the Judge that if the injunction were made operative at once the lighting company's loss would be far greater than that which would *ad interim* be suffered by plaintiff. In other words, the company will be granted ample opportunity to relocate its plant.

THE New Orleans (La.) authorities in charge of what is known as the "Square Fund"—a fund that is being raised for the beautifying of the squares or small parks throughout the city—recently forwarded a letter to the New Orleans Gas Light Company, which, divested of its formalities, is as follows: "On the 14th of this month (Sept.) we propose giving a concert on Washington Square for the benefit of the 'Square Fund.' Inasmuch as the present system of lighting (electric) is totally unreliable and we cannot depend upon having light even when most needed, we take the liberty of calling upon you as a staunch friend of this community and a liberal contributor to all occasions of public benefit, to furnish us with gas light around the square for the above occasion. We ask this, feeling assured in advance our request will be heartily responded to and that we may rest easy on the light question." Secretary Vallois, on be-

half of the Company, answered that the latter would cheerfully grant the request, which promise was faithfully adhered to.

THE Putnam (Conn.) Gas Light Company has wiped out all traces of the conflagration that followed the introduction of a crudely-equipped water gas plant in its works. The proprietors have not abandoned their intention of manufacturing water gas, however, because the destroyed apparatus has been replaced by a complete plant of the English type—the first one, we believe, set up in New England. The apparatus was installed under the superintendence of Mr. H. McKay, of Titusville, Pa.

SUPT. BECK seems to have managed to put the Galveston (Texas) works in good condition. We judge so from an announcement made some time ago by Secretary Buttlar that all gas used for heating or cooking purposes in the Island City would be charged for at the rate of $2 per thousand cubic feet. Well done, Messrs. Beck and Buttlar.

THE authorities of Omaha (Neb.) have received the following propositions in respect to the public lighting: Thomson-Houston Electric Light Company—from dusk until daylight each night in the year—on a 5-year basis: 50 lamps, $18 each per month; 100 lamps, $17; same on a 10-year basis: 50 lamps, at $16; 100, at $15.25; 200, at $14.50. The Gas Company offered to supply gas lamps—yearly contract—at $31 each per annum, or at $29 on a 3-year contract. The propositions were referred.

THE ordinance appropriating $70,000, or so much thereof as may be needed, for establishing an electric light plant in Pawtucket, R. I., has been concurred in by the Board of Aldermen. We do not know whether this settles the question or not; but if it does we respectfully suggest that the farce might be capped by naming Alerman Meagher for the Superintendency of the establishment—when completed.

AS was intimated in the JOURNAL, the stockholders in the Municipal Gas Company, Albany, N. Y., have assented to the proposed increase in capital stock—from $1,000,000 to $1,500,000. About 90 per cent. of the entire capital was represented at the meeting held to pass on the question.

AT a stockholders' meeting of the Laclede (St. Louis, Mo.) Gas Light Company, the majority voted power to the Directors to raise $500,000 for the purpose of putting in an electric light plant, and to meet expenditures for extensions to the gas plant. It was left optional with the Directors whether the money should be obtained by increasing the capital stock of the Company from $2,500,000 to $3,000,000, or whether an issue of bonds should be made. President Keiser, who has returned from his Southern and Eastern trip, seems to believe more firmly than ever in the strength of the gas business in general, and in the solidity of the Laclede Company in particular.

THE Pacific Lighting Company, whose main offices, on the corner of Annie and Stevenson streets, adjoin the Palace Hotel (San Francisco, Cal.), evidently intends to make an impression on the gas trade of the Pacific Coast. The Company some time ago obtained control of the gas plants at San Bernardino and Eureka, Cal., and its latest acquisition is the purchase of the Santa Rosa (Cal.) Gas and Electric Light Company. This is bound to become an important place in the economy of the Golden State. It now contains something over 8,000 inhabitants, and is in the center of that beautiful district known as the Great Russian River Valley. The Company is officered as follows: President, J. M. Livingston; Secretary and Manager, W. B. Cline; Treasurer, C. O. G. Miller.

ANOTHER instance of the greed of gas companies is furnished in the offer of the Montclair (N. J.) Gas and Water Company to supply without charge, gas for the illumination of the new and handsome fountain recently erected in the center of the town.

THE Framingham (Mass.) Selectmen do not seem to have comprehended the necessities of the local situation after all. True, they granted the petition of H. S. Jackson and associates, of Boston, Mass., for the right to operate a gas works in Framingham, but as these gentlemen propose to manufacture and supply gas under the Fahnehjelm system, we fear that Framingham is no better off than before in respect to the likelihood of obtaining a satisfactory plan of artificial lighting.

THE Burlington (Vt.) Brush-Swan Electric Light Company having been absorbed by the Gas Company, the public lighting contract held by the former has been abrogated by mutual consent of the city and the Gas Company. In lieu thereof the following agreement has been made, the same to terminate on Sept. 1, 1891—the city, however, reserving the right to continue the agreement until Sept. 1, 1893, should it so elect: The Gas Company binds itself to furnish 100 or more 2,000-candle power Brush arcs, to burn on 21 nights per month from half hour after sunset until 12:30 A.M., for the sum of 30 cents each per night; and to furnish all night lights (not less than 25 in number, however, and all to be on one circuit), for the sum of 50 cents each. If other lights in excess of the number stated be ordered during the time specified, the rate of payment for each is to remain unchanged.

CAPT. WHITE has been awarded the contract for the construction of the retort house and benches intended to extend the carbonizing capacity of the Richmond (Va.) City gas plant. The house is to have the dimensions of about 60 ft. by 55 ft., by 30 ft. in height. The bench work calls for the erection of 6 benches of sixes, and the laying of foundations for 4 additional benches. He is to furnish all necessary iron-work and equipment, and to connect the addition to the existing plant. The work is to be finished by Feb. 1, 1889. The contract price calls for the payment of $18,307.95.

THE San Diego (Cal.) Gas and Electric Light Company expects to have its electric annex in operation on or about Nov. 1.

THE bids submitted in response to the invitation from the authorities of Toledo, Ohio, for the right to light the streets were as follows: Toledo Gas Light and Coke Company—to city, $1.25 per M.; to citizens, $1.35 per M.; contract to last 5 years. Weston Electric Light and Power Company—2,000-candle power arc lights, $84 each per annum. Toledo Electric Company—300 arc lights in gas territory, $85 each per annum; incandescent lights (16-candle power), $1 each per month.

ARTICLES incorporating the Santa Monica (Cal.) Lowe Gas Company have been filed. The incorporators are Messrs. Wm. S. Vawter and Jesup W. Scott, of Santa Monica, and L. E. Mosher, T. S. C. Lowe and W. C. Callahan, of Los Angeles. The objects set forth are: "To manufacture gas and electricity, and to sell the same; also, to manufacture and sell gas and electric machines, and to operate gas and electric motors." The principal place of business is Santa Monica, and the duration of the charter is returned at 50 years. Santa Monica is a noted summer resort of Los Angeles county, and is about 15 miles by rail west of the city of Los Angeles.

WE understand that a syndicate of Boston capitalists, having purchased the plant and franchises of the Middleboro (Mass.) Gas Company, will adapt the works to the manufacture of water gas. Hitherto an oil gas, diluted with air to the extent of 40 per cent., has been distributed at Middleboro; and although the average candle power of the mixture, as shown by the last annual report of the State Gas Commission, is somewhat in excess of 25 candles the consumers are constantly complaining at the wretchedness of the service. Possibly the discontent is strongly added to from the fact that the average price charged for gas sold in Middleboro in 1885–6 (no return under this head was made by the Company for 1886–7) was $4.33 per thousand. The Boston capitalists, however, have not made a mistake in securing control of this property, for it can easily be placed on a paying basis.

THE Walla Walla (Wash. Ter.) Penitentiary Commission have authorized the Seattle Electric Light Company to put in a plant of the Edison type for the lighting of the State jail. The contract price is $9,500.

THE Woonsocket (R. I.) Gas Company will practically rebuild and renew its condensing and scrubbing department. In fact Supt. Jenks is now at work on the foundations for the building.

AS usual, and in accordance with the inevitable terms, the gas war at Maysville (Ky.) has terminated. Some two years ago one or more local "benefactors" decided that Maysville ought to have cheaper gas, and, with the bluster usual in such cases, organized a Citizens Gas Light Company. Works were built—not before an attempt at consolidation with the old Company was made, however—and the selling rate was cut from $3 to 75 cents per thousand cubic feet. The courts were frequently invoked, and many queer complications resulted. The opposition succeeded in inducing the authorities to make a ten-year agreement for the public lighting, and every probable way of weakening the position of the original gas suppliers was experimented on. The owners of the old Company were not to be dislodged, and the assaults of the enemy eventually lacked that vigor which at first characterized them. Indeed their initial violence was too great; for, with the opening of September, the "benefactors" wearied of the fray and weakly signified their willingness to end

the struggle. The terms were shortly agreed upon, and the whole matter has been compromised by the amalgamation of the two interests, the old Company now being virtually in possession of the lighting field. It is understood that neither plant is to be shut down, and that a revision of selling rates will at once take place—in all probability the maximum gross rate will be put at $2.25 per thousand.

In the meantime, now that the Maysville gas supply has been consolidated, certain residents of the city are agitating the subject of organizing an electric lighting company in the place.

The appended letter will, in part, occasion much regret to the fraternity:

Worcester Gas Lt. Co., Worcester, Mass., Sept. 27, 1888.

To the Editor American Gas Light Journal: An item for you perhaps will be found in the annual meeting of this Company, which was held on September 12th. The old Board of Directors was re-elected, viz.: Jos. Sargent, Calvin Foster, A. G. Bullock, Waldo Lincoln, Jas. E. Davis, S. Woodard and J. H. Clark,. The officers chosen were, Joseph Sargent, President, and J. P. Hamilton, Treasurer and Clerk.

I have put in my resignation as Agent and Superintendent, and the same has been accepted. G. E. Weatherbee, my former assistant, has been appointed acting Agent and Superintendent. I have nothing to do now, except to get well, which I hope to do sometime. I do not feel now as though I should ever care for more gas works; and am very sure that I shall never feel like doing as much hard work as heretofore.

Yours truly, J. H. Rollins.

We, in common with all his many friends, felt certain that Mr. Rollins was rapidly regaining health and strength, and that his recent sojourn in the South would hasten the day of his complete restoration. We cannot spare men like Rollins from the ranks, and while we must admit that absolute rest is the most likely panacea for his malady—the pangs of which have been borne by him with indomitable fortitude—we are not ready to accept his retirement as final. After the requisite furlough has been availed of we shall expect him to again report for duty.

Elsewhere we mention improvements that have been made at the Putnam (Conn.) works, and in addition to that statement we append the following particulars just to hand from a correspondent: "Putnamites are congratulating themselves on their Gas Company, which, having taken a new start, now seems to be on a solid business basis. At consid erable expense the proprietors have installed a new and modern plant, and the gas now being distributed from it is an excellent proof of the wisdom of the step. The selling rate has been cut from $4.50 to $2 per thousand, which rate will be further reduced when a certain output has been reached. A meeting of the stockholders was held some days ago, and after the transaction of certain financial matters an election was entered into with the following result: John J. May and Ira H. Bickford, of Boston, Mass., and C. E. Searls, S. H. Seward, Chas. S. Chesebro, Prescott Barrett, and G. E. Dresser, of Putnam, were chosen Directors; the Board then elected C. E. Searls President, S. H. Seward being selected Secretary and Treasurer. Mr. Albert Malm was employed to take charge of the works. He is a good engineer, and is bound to become popular. The Company means business, and proposes to give Putnam as good gas, and at as low figures, as any other place of its size in the country.—Haddam."

Among recent shipments made by the Ball Engine Company (Erie, Pa.) of its "High Speed Automatic Cut-off Engines," we note the following:

Ada (O.) Electric Light Co	One	80	horse.
Atlantic City (N. J.) Electric Light Co.	"	200	"
Akron (O.) Electric Street R. R. Co.	Two	200	"
Blaisdell Pride, Jacksonville, Fla	One	40	"
Brattleboro (Vt.) Gas Light Co	"	80	"
City of Greenville, S. C.	"	100	"
Cummer, W. W., Cadillac, Mich	"	100	"
City Gas Light Co., Norfolk, Va	"	80	"
Denver (Col.) Electric Illuminating Co	Two	80	"
Danville (Pa.) Electric Light Co	One	80	"
Electric Automatic Transit Co., Balt., Md.	"	100	"
Kuhnke, Paul, Clyde, O.	"	25	"
Lynn (Mass.) Gas Light Co	"	100	"
Olean (N. Y.) Electric Light Co	"	60	"
Pensacola (Fla.) Electric Light Co.	"	100	"
Paterson (N. J.) Electric Light Co.	Three	100 horse,	
Thomson-Houston Internat'l Elec. Co., Hioga, Japan	"	25	"
" " " Australia	"	60	"
Seeger & Hernsey, St. Augustine, Mexico	"	25	"
Walla Walla (Wash. Ter.) Electric Light Co.	"	35	"

The fatal results of a break in the River street main (Jan., 1887) of the Troy Fuel Gas Co. caused a suspension by the Common Council of the rights possessed by the Company under its charter, and at a recent meeting of the Council a resolution was offered providing for a restoration of the suspended privileges. The resolution was referred to the law committee, who subsequently gave a hearing to those interested—Messrs. Treanor and Curtis, of the committee, were associated with Corporation Council Parmenter during the session. In July following the suspension of the Company's rights an ordinance, recommended by Mr. Parmenter, was passed by the Council. The ordinance (it was published in full on p. 374 of our issue for June 16, 1887) regulated the plan of laying pipes and supplying gas (either illuminating or fuel) in the city. In the instance of fuel gas the ordinances contained a provision making it necessary that the gas should be odorized, etc., and the request for the renewal of the Company's rights was, of course, subject to the rules laid down. Gilbert Geer, Jr., appeared for the petitioner, and John H. Peck was present as the representative of a number of citizens. Mr. Geer said the stock of the original Company was now largely in the hands of Philadelphia capitalists. The old Hannibal Green spring works were bought by the Company, and the latter had invested $75,000 on the property, including $30,000 invested in machinery. "It is the Company's intention to spend more," said Mr. Geer, "and it intends to lay mains and supply the city with fuel gas this fall." He said the laundries wanted the fuel gas, and he understood that the opposition to the Company's petition emanated from the present Troy Gas Companies. Mr. Curtis asked in what way the public would be benefited by the Company's renewed lease of life, to which Mr. Geer replied that the citizens would be furnished with a much cheaper illuminant than that now supplied. Mr. Peck said the franchise only admitted the sale and distribution of gas for heating and mechanical uses, under the Lowe patents, and held that under this provision the Company could not supply an illuminating gas. Mr. Geer said that that very provision would enable the Company to supply either a heating or an illuminating gas, or both. Mr. Peck then said he had been informed that this application was simply a wedge to open up the ground for the formation of a Trust to control the entire sale of gas in Troy—a Trust that would be operated in the interest of capitalists not otherwise identified with Troy and her advancement. Mr. Geer disclaimed all knowledge of such a scheme. At this juncture both parties expressed a wish for a subsequent hearing, and the session was adjourned.

We are in receipt of a copy of the Gilbert & Barker Manufacturing Company's latest pamphlet, and quite a gem in the way of printing it undoubtedly is. Of course, we take it for granted that our readers are aware of the fact that this Company is the producer of the justly celebrated Springfield Gas Machine, and as those interested in gas works proper are often appealed to by the residents of districts remote from lines of gas mains, for information concerning an automatic gas machine that may be trusted to do its work properly trouble may be saved and a good turn performed at one and the same time by telling the inquirers to write on for a copy of the Company's handsomely illustrated pamphlet.

In connection with the Gilbert & Barker Company it might further be said that it has by arrangement succeeded to the Eastern and Middle States' trade formerly held by the Combination Company, Detroit, Michigan.

The destruction by fire of the beautiful structure known as the First Presbyterian Church, New Brunswick, N. J., has naturally given rise to widespread regret, and many theories have been advanced to account for the disaster. Prominent among the theorists appear those identified with the local incandescent electric lighting company, who are industriously pursuing the "stop thief" line of argument—or, rather, are attempting to convince the doubters that matches and mice were the responsible agents. Despite their explanations that do not explain the impression prevails that the electric Company's wires are alone chargeable with the destruction of the edifice.

At the annual meeting of the Woonsocket (R. I.) Gas Company the following officers were elected: Directors, Messrs. H. C. Kimball, O. J. Rathbun, Jno. W. Ellis, H. F. Lippitt, G. M. Welles, J. E. Cole, J. P. Ray, F. Harris and Gilbert Darling; President, H. C. Kimball; Sec. and Treas., Reuben G. Randell; Supt., Old Reliable Z. M. Jenks. The special committee intrusted with the investigation of the feasibility of engaging the Company in the supplying of electric light made a report, but the conclusions reached will not at present be made public. The Company enjoyed a most prosperous year.

Mayor Parsons, of Rochester, N. Y., is greatly opposed to the further increased employment of arc lights for public purposes in that city. And his objections are well founded, for within 14 months the expenses of the lamp department have increased from $93,017.52 to $143,136.48; and arc lights are responsible for about 85 per cent. of the increase noted.

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,

PROPRIETORS.

EDITOR—Jos. R. Thomas, C.E.

ASST. EDITOR—T. J. Cunningham.

MANAGER—C. E. Sanderson.

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TUESDAY, OCT. 2, 1888.

The Market for Gas Securities.

The market for Consolidated gas easily kept the advance of a fortnight ago, and in fact closing quotations for the month are 1½ points higher than those recorded in the opening days of September. We need not look for any further marked fluctuation until the declaration of the dividend, or shortly before the announcement of the rate is made. Some holders are disposed to assert that an increase in the return is quite likely, whereas conservative owners think such a step would not be in line with wisdom. However, let the ultimate outcome be what it may investors in Consolidated are on the safe side in any event. We still hold that the shares are cheap at current prices—82½ to 83. The Equitable Company has declared a dividend of 2 per cent., due from yesterday. Brooklyn shares are steady to strong, with good prospects for a further rise in almost every name on the list. The following sales at auction have been made: 17 Mutual (city), at 99¾; 14 shares Citizens (Brooklyn), at 52½, and 50 shares same Company, at 50½. The Boston situation is still in the hands of the rumor mongers, but there is no doubt that European capitalists have been considering the availability of joining hands with the Bay State syndicate. Rumor also has it that an effort is being made by Philadelphia capitalists to secure control of the gas supply of Troy, N. Y. The St. Louis position is about as before, although the members of the Gas Commission and the Presidents of the old St. Louis and the Laclede Gas Light Companies have held one or two conferences regarding the proposed purchase by the city of the local gas plants. The gas officials gave it as their opinion that the stockholders would agree to any fairly liberal proposition on the part of the city. The National Tube Works Company have secured a judgment, amounting to $7,664.76, against the Gogebic Water and Gas Company, of Hurley, Wisconsin.

Advertisers Index.

GAS ENGINEERS. Page

Jos. R. Thomas, New York City 244
Wm. Henry White, New York City 238
Wm. Mooney, New York City 244
William Gardner, Pittsburgh, Pa 244
Fred. Bredel, N. Y. City 243

PROCESSES.

National Gas Light and Fuel Co., Chicago, Ills. 238
American Gas Improvement Co., Pittsburgh, Pa 238
Bartlett, Hayward & Co., Baltimore, Md 235
Wm. Henry White, N. Y. City 238
United Gas Improvement Co., Phila , Pa 237
Henry Pratt & Co., Chicago, Ill 234

SCRUBBERS AND CONDENSERS.

G. Shepard Page, New York City 200
R. D. Wood & Co., Phila., Pa 246

GAS GOVERNORS.

Connelly & Co., New York City 239
R. K. Huntoon, Franklin, Mass 233
Fred. Bredel, N. Y. City 243
Freidrich Lux, London, England 233

TAR AND CARBONIC ACID EXTRACTOR.

Geo. Shepard Page, N. Y. City 236

CEMENTS.

C. L. Gerould & Co., Brooklyn, N. Y 242
H. W. Johns Manufacturing Co., N. Y. City 234

GAS ENRICHERS.

Standard Oil Co., Cleveland, Ohio 248

GAS METERS.

Harris, Griffin & Co., Phila,, Pa 250
American Meter Co., New York and Philadelphia 251
The Goodwin Gas Stove and Meter Co., Philadelphia, Pa 251
Helme & McIlhenny, Phila., Pa 251
D. McDonald & Co. Albany, N. Y 251
Nathaniel Tufts, Boston, Mass 250
Maryland Meter and Manufacturing Co., Baltimore, Md 250

EXHAUSTERS.

P H. & F. M. Roots, Connersville, Ind 234
Smith & Sayre Manufacturing Co., New York City 247
Wilbraham Bros., Philadelphia, Pa 239
Connelly & Co., New York City 239

GAS COALS.

Penn Gas Coal Co., Phila., Pa 249
Perkins & Co., New York City 248
Newburgh Orrel Coal Co., Baltimore Md 249
Despard Coal Co., Baltimore, Md 249
Chesapeake and Ohio R.R. Coal Agency, N. Y. City 249
Westmoreland Coal Company, Phila., Pa 249
Monongahela & Peters Creek Gas Coal Co., Pittsburgh, Pa 249
Cannelville Coal and Iron Co., Chicago, Ills 249

CANNEL COALS.

Perkins & Co., New York City 248
J. & W. Wood, New York City 248

GAS WORKS APPARATUS AND CONSTRUCTION.

James R. Floyd & Sons, New York City 247
T. F. Rowland, Greenpoint, L. I 247
Delly & Fowler, Phila., Pa 247
Kerr Murray Mfg. Co., Fort Wayne, Ind 246
Stacey Mfg. Co., Cincinnati, Ohio 247
Bartlett, Hayward & Co., Baltimore, Md 235
Morris, Tasker & Co., Limited, Phila., Pa 246
Davis & Farnum Mf'g. Co., Waltham, Mass 245
R. D. Wood & Co., Phila., Pa 246
Bouton Foundry Co., Chicago, Ills 247
Smith & Sayre Manufacturing Co., New Yotk City 247
Fred. Bredel, N. Y. City 243
United Gas Improvement Co., Phila., Pa 237
Henry Pratt & Co., Chicago, Ill 234

GAS AND WATER PIPES.

Gloucester Iron Works, Phila., Pa 244
Mellert Foundry and Machine Co., Reading, Pa. (John Fox, Selling Agent, N. Y.) 244
Ohio Pipe Co., Columbus, Ohio 244
M. J. Drummond, New York City 244
Wells Rustless Iron Co., New York City 244
R. D. Wood & Co., Phila., Pa 246
Warren Foundry & Machine Co., New York City 244
Donaldson Iron Co., Emaus, Pa 233

REGENERATIVE FURNACES.

Bartlett, Hayward & Co., Baltimore, Md 235
Fred. Bredel, New York City 243
Chicago Retort and Firebrick Co., Chicago, Ills 243
H. C. Hann, Baltimore, Md 234
Wm. Henry White, N. Y. City 238

RETORTS AND FIREBRICK.

J. H. Gautier & Co., Jersey City, N. J 242
B. Kreischer & Sons, New York City 242
Adam Weber, New York City 242
Laclede Fire Brick Works, St. Louis, Mo 242
Brooklyn Retort and Fire Brick Works, Brooklyn, N. Y 242
Borgner & O'Brien, Phila., Pa 242
James Gardner, Jr., Pittsburgh, Pa 242
Henry Maurer & Son, New York city 243
Chicago Retort and Fire Brick Co., Chicago, Ills 242
Baltimore Retort and Fire Brick Co., Baltimore 242
Oakhill Gas Retort and Fire Brick Co., St. Louis, Mo 242
Emil Lenz, New York City 242

VALVES.

Ludlow Valve Manufacturing Co., Troy, N. Y 240
John McLean, New York City 240
Chapman Valve Manufacturing Co., Boston, Mass 240
R. D. Wood & Co., Phila., Pa 246

PURIFYING MATERIAL.

Connelly & Co., New York City 239
Freidrich Lux, London, England 233

GAS ENGINES.

Schleicher, Schumm & Co. Phila., Pa 216
Clerk Gas Engine Co , Phila., Pa 240

ENGINES AND BOILERS.

Jarvis Engineering Co., Boston, Mass 239
Ball Engine Co., Erie, Pa 233

GAS LAMPS.

The Siemens-Lungren Co., Philadelphia, Pa 245
G. Shepard Page, New York City 240
Albo-Carbon Light Co., Newark, N. J 239
Standard Gas Lamp Co., Phila., Pa 233
U. S. Pat. Wenham Gas Lamp Co., New York City 233

PURIFIER SCREENS.

John Cabot, New York City 240
Geo. A. Mills, Baltimore, Md 240

GAS STOVES.

American Meter Co., New York and Philadelphia 241
The Goodwin Gas Stove and Meter Co., Phila. Pa 252
Dinsmore Manufacturing Co., Boston, Mass 240

STREET LAMPS.

J. G. Miner, Morrisania, New York City 197
Bartlett Street Lamp Mf'g Co., New York City 234

BURNERS.

C. A. Gefrorer, Phila., Pa 248
Matchless Lighting Co., N. Y. City 240

STEAM BLOWER FOR BURNING BREESE

H. E. Parson, New York City 204

GASHOLDER TANKS.

W. C. Whyte, New York City 246

GASHOLDER PAINT.

H. W. Johns Manufacturing Co., N. Y. City 234

COKE CRUSHER.

C. M. Keller, Columbus, Ind 249

ELECTRICAL APPARATUS.

Waterhouse Electric & Manufg Co., Hartford, Conn 235
Wm. Henry White, N. Y. City 238

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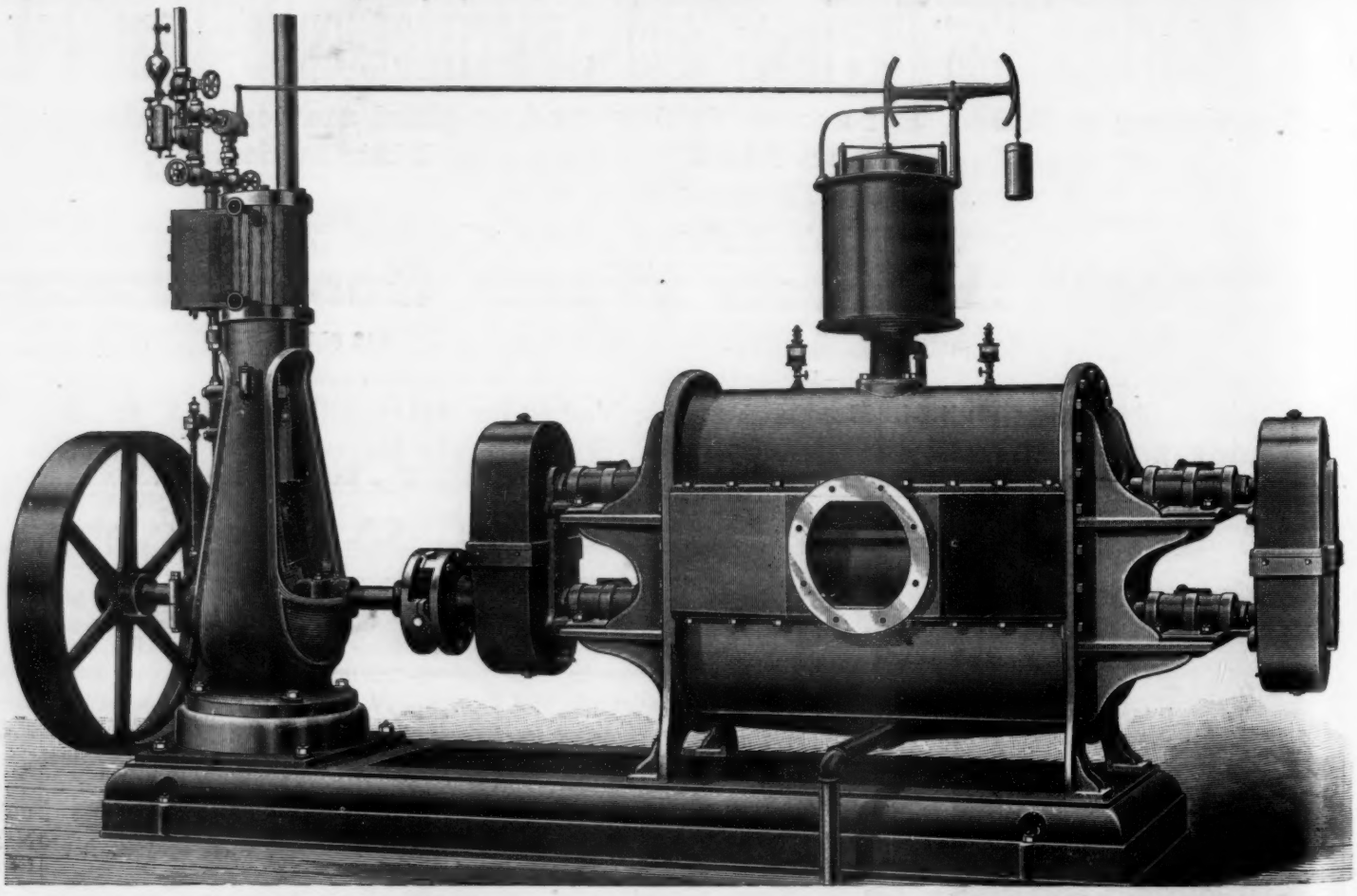

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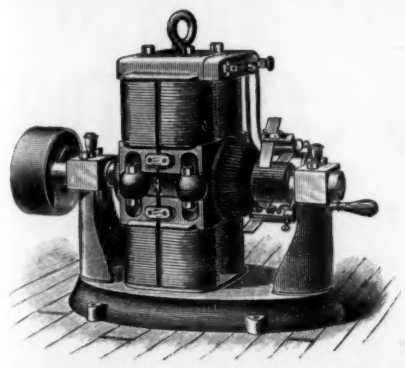

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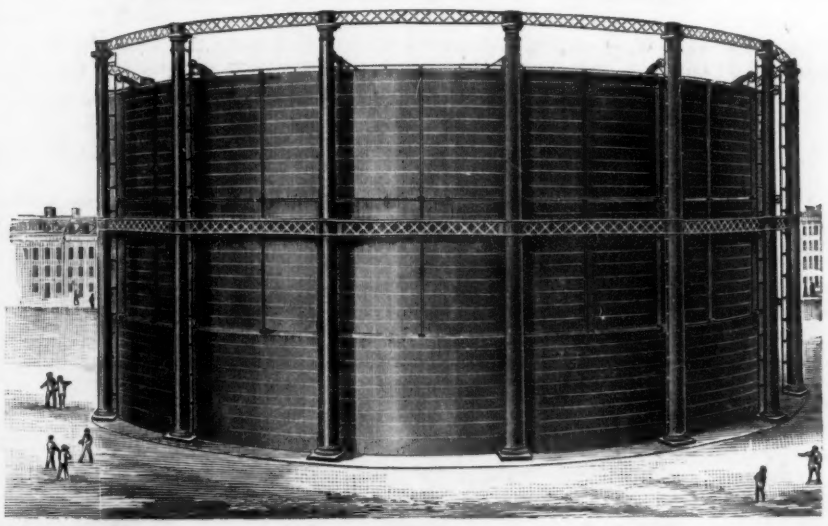

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The following Engineers have personally given permission to refer to them:

G. C. Trewby, Esq., Engineer-in-Chief of the Gas Light and Coke Co., London. The manufacturing plant at Beckton is built in complete sections of 3,000,000 cubic feet capacity each. A Walker Tar Extractor has been fitted to each one of these sections. This was done after a long and thorough trial on one of its sections. The Tar Extractor has been supplied to other works of the Gas Light and Coke Co., including those of which John Methven, Engineer of the Gas Light and Coke Co. at the Nine Elms Station, is in charge. Also to G. E. Stevenson, Peterborough Gas Works; B. Green, Mitcham and Wimbledon Gas Works; W. H. Smith, Bedford Gas Works; F. Linging, Norwich Gas Works; J. T. Browning, Colchester Gas Works; S. B. Darwin, Portsmouth Gas Works; J. McCrae, Dundee Gas Works; W. J. Wells, Stamford Gas Works; J. M. Darwin, Longton Gas Works; J. Paterson, Warrington Gas Works; and J. Coulter, of the Dundalk Gas Works. All of the foregoing gas works are located in Great Britain.

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No. 3,	"	"	250,000	"	"	"	5 "	"	"	"
No. 4,	"	"	500,000	"	"	"	6 "	"	"	"
No. 5,	"	"	750,000	"	"	"	7 "	"	"	"
No. 6,	"	"	1,000,000	"	"	"	8 "	"	"	"
No. 7,	"	"	1,250,000	"	"	"	9 "	"	"	"
No. 8,	"	"	1,500,000	"	"	"	10 "	"	"	"
No. 9,	"	"	2,000,000	"	"	"	12 "	"	"	"
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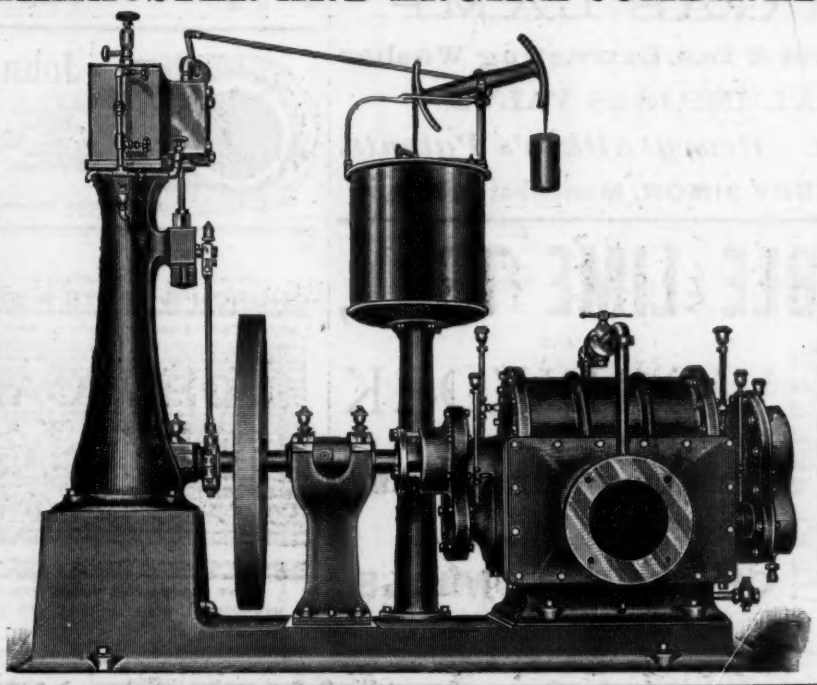

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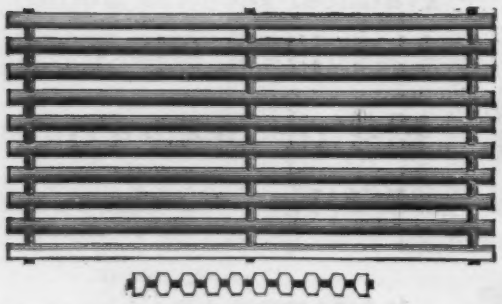

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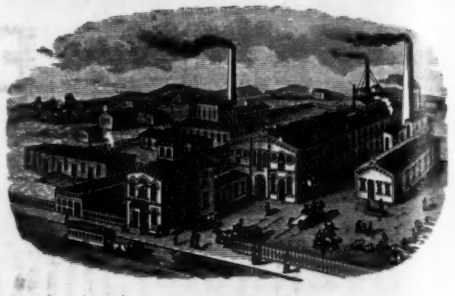

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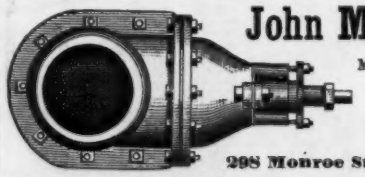

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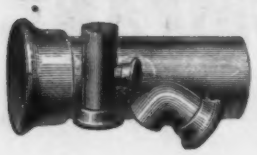

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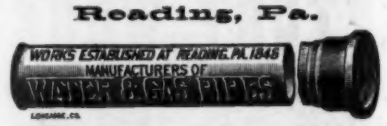

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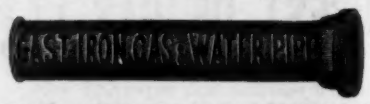

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Gas Companies contemplating the purchase of electric lighting plants, will do well to investigate the results that can be accomplished by a general introduction of the Lungren Regenerative Gas Lamp. In a number of instances Gas Companies have purchased these lamps and rented them to their consumers at a low rate, this plan proving satisfactory to the consumer, and profitable to the Gas Company. It requires but a small expenditure to establish a lighting system with the Lungren Lamp, which in its results will compare favorably with any system of electric lighting, both as to economy and effect. Numerous consumers have also been obtained by Gas Companies introducing these lamps, from among those using kerosene oil. Write us for particulars.

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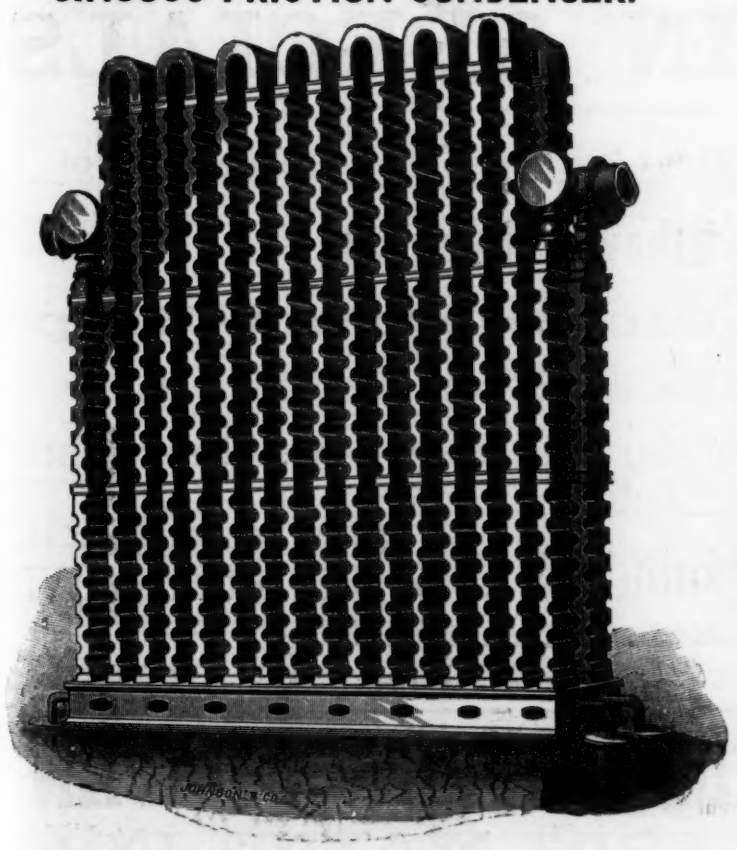

We desire to draw the attention of the gas community to the merits of the SINUOUS FRICTION CONDENSER. Companies intending to introduce new condensers into their works will do well to confer with us and examine plans and estimates before contracting for any other pattern The FRICTION CONDENSER is now in use at the gas works located in the following places:

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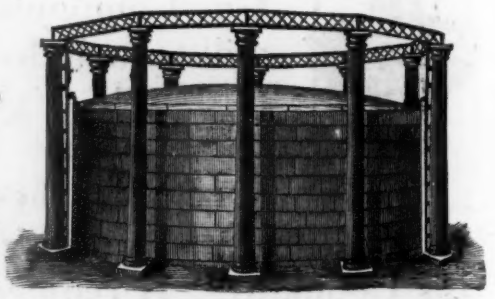

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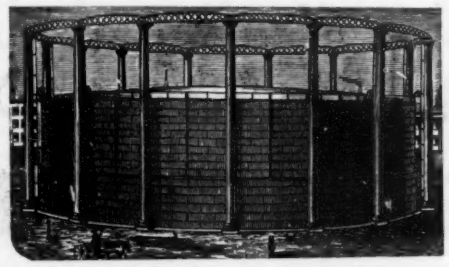

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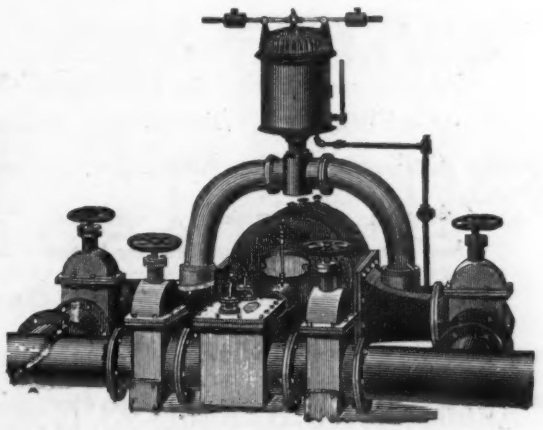

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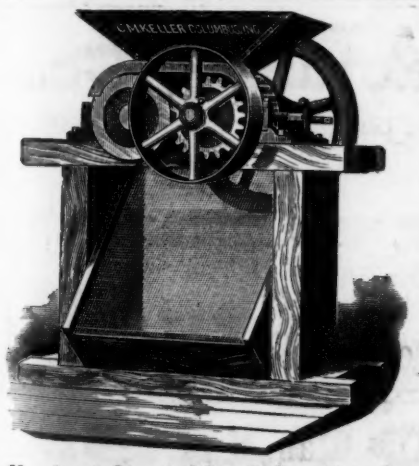

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We use only the very best materials, and employ the most skilled labor, and by our long experience (32 years) and personal supervision of every detail, we feel justified in assuring the public that our goods will give perfect satisfaction. Every Meter emanating from our establishment will bear the State Inspector's Badge, and will be fully warranted by us. Our Annual and Calendar will be sent to Gas Companies upon application.

GAS STOVES. GAS STOVES. GAS STOVES.

THE GOODWIN GAS STOVE AND METER CO.,

1012-18 Filbert St., Phila., 142 Chambers St., N. Y., 76 Dearborn St., Chicago.

Agents, WALDO BROTHERS, 88 Water Street, Boston.

WM. W. GOODWIN, Pres. and Treas.
W. H. MERRICK, Vice-Pres.
S. LEWIS JONES, Sec.

SAMUEL V. MERRICK, Supt.
G. B. EDWARDS, Mang'r, N. Y.
S. S. STRATTON, Mang'r, Chicago.

SOLE MANUFACTURERS OF THE

"SUN DIAL" GAS STOVES,

The Most Economical, Efficient, and Durable Gas Stove Made.

GAS COOKING STOVE, No. 8 C.

SIZE.

Stove.	Oven.	Roaster.	Top.	Length over Extension Shelves,
37 in. high.	12 in. high.	12 in. high.	24 in. long.	36 in.
20 in. wide.	17½ in. wide.	18 in. wide.	21 in. wide.	
	12 in. deep.	13 in. deep.		

This Stove has four burners on top, and double oven burner.

Consumption of gas with all burners in use, 42 feet per hour, at 1 inch pressure.

The top is made in sections, so that a greater variety of cooking utensils may be used. By lifting out the covers and crosspieces and putting in a suitable forked ring, which is sent with each stove, a wash boiler or other large utensil may be set over two burners. Our **No. 87 GRIDDLE** also fits in the same position. The roasting oven is provided with a cast-iron door.

All Fittings are Nickel-Plated.

GAS COOKING STOVE, No. 7 B.

SIZE.

Stove.	Oven.	Roaster.	Top.	Length over Extension Shelves,
31 in. high.	9½ in. high.	10 in. high.	21 in. long.	32 in.
17 in. wide.	14½ in. wide.	15 in. wide.	16 in. wide.	
	12 in. deep.	13 in. deep.		

This Stove has three boiling burners in the Top or Hot Plate, and one single oven burner.

This cut represents our New Style Cooking Stove. As will be seen, it has an ornamented cast-iron Base and Front, and extension shelves. The Oven Burner, which is atmospheric (unless otherwise ordered), is of an entirely new and improved pattern (patent). The ovens are of greater capacity than those of the old style. The Top, in conjunction with the Outlet Pipe, is designed to carry off all the products of combustion, if desired, but they are also supplied with a loose ring which converts it into an ordinary open top stove.

The consumption of this Stove is 35 cubic feet per hour at 1 inch pressure, with all Burners in use.

All Fittings are Nickel-Plated.

"RADIANT" BOILING STOVE, WITH REGENERATIVE BURNER.

Size, 6¼ inches diameter, 8 inches high. Consumption, 6 feet per hour at 1 in. pressure.

HOT PLATE, No. 111.

Size, 36 in. long, 12 in. wide, with three double burners, 6 taps.

Consumption, with all burners in use, 36 cubic feet per hour, with 1 in. pressure.

¾ in. supply pipe should be used where the pressure is 1 in. or over.